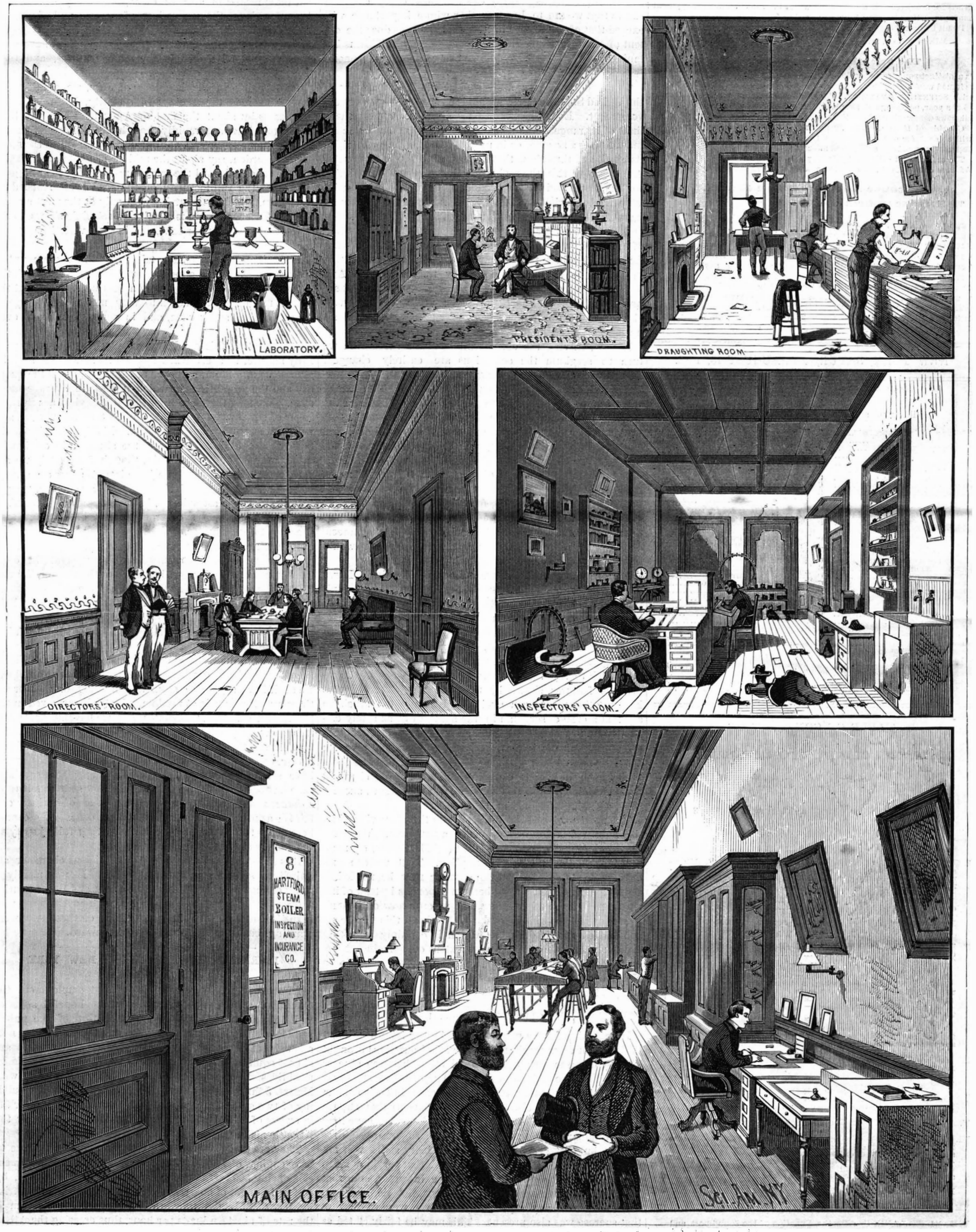
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLIX.—No. 7. [NEW SERIES.] NEW YORK, AUGUST 18, 1883. [$3.20 per Annum. [POSTAGE PREPAID.]



HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY.—[See page 100.]

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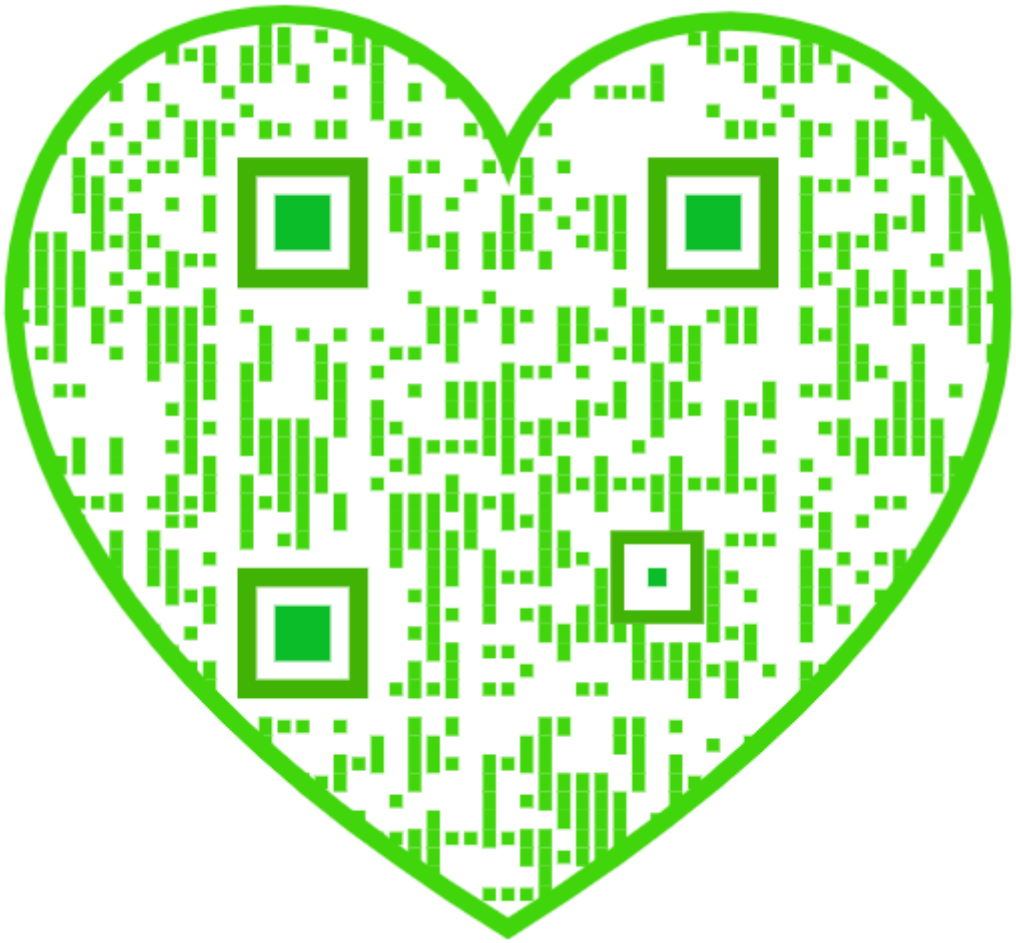

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, AUGUST 18, 1883.

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THE SUGAR CANES.

In a recent number attention was drawn to the fact that apparently a great, in reality a very radical, change in the sugar production of the United States was coming, and that too without long delay. It is laboratory work which has rendered this practicable. As in so many instances, mechanical skill has availed itself of minute scientific results, and the grains or granules of the chemist's test tubes and balances have become the predecessors and originators of the barrels of sugar from the boiling house and the refinery.

In order that we may see clearly how this has been done, and to what immense results it is about to lead, we need to look to the two kinds of sugar cane with which we have to deal. Hitherto we have had practically but one, that known botanically as *Saccharum officinarum*, and in common language universally as "sugar cane." Now every evidence shows that we are to have another whose importance will exceed that of the former in the same ratio as does the extent of territory available for its cultivation. This is botanically *Sorghum vulgare*, known everywhere by its generic title as "sorghum."

The saccharum is a semi-tropical plant, and no part of the United States is fairly within the range of its perfect development. Even the Gulf States are along the northern limit of its range for any available purposes, so much so indeed that in no case, or in next to none, is it able to ripen its seed, and thus show that it has reached its full maturity. As a result of this, the region which can be made profitable for its growth and for the production of sugar is necessarily very much restricted. Mississippi, Alabama, and Georgia have given but little attention to cane growing. Florida and Texas reach far enough south to be in the best position of all, but industrially they have as yet accomplished little. Louisiana has been the "sugar State," and the cultivation of sugar cane has been bounded by the Red River. And the immense results dependent on this industry are best appreciated from the fact that even under these adverse circumstances our annual yield of sugar has come nearly up to 200,000,000 pounds.

If now, leaving the consideration of the saccharum we turn to sorghum the conditions are entirely changed. The plant needs no such long continued heat. It is perfectly well known that the cultivation of sorghum can be carried on to full satisfaction in almost every State of the Union. New England will probably never do much in that way, except in its southern and southwestern limits, but neither Minnesota nor Dakota will be beyond the range, for they produce the plant now abundantly. The trouble however has been that the yield of sugar from the sorghum has been totally capricious and uncertain. That the sugar was present in the cane was sure, for the juice if boiled properly yielded invariably a very sweet sirup; but while occasionally this sirup would crystallize beautifully, in other instances, and in truth almost always, not a grain of sugar would make its appearance.

A crop of sorghum therefore had no definite value. It was not possible to tell while it was in the field what might result from its working. Very naturally then it did not rank high in public favor. It had its merits, for sirup and for forage, and in the Northwestern States especially it has never ceased to be grown to a large extent. But now comes in the laboratory work to which reference has been made. It is not too much to say that now we know the causes of the capricious features shown by the sorghum juice, and that knowing the evil we can avoid it. It is not too much to say that a crop of sorghum in the field can be as safely calculated on to yield its full quota of sugar of first quality as can a crop of saccharum, and still further that acre for acre its best varieties will yield fully as much sugar as is obtained from the ribbon cane in Louisiana. The chemical points which establish this belief we will consider at another time, speaking now only of the results.

The *future sugar* of the United States therefore viewed in this light will be for us nationally a new item. We have imported annually at least 1,700,000,000 pounds, or more than nine-tenths of our consumption. That we can produce 2,000,000,000, or whatever more may be needed, is certain. Why should we not become exporters instead of importers? We should interfere with no crop now cultivated, as we propose presently to show. And all this can be accomplished were it desirable (which it certainly is not) to encroach no further on the vast extent of domain not yet brought under human use. The corn bands from Ohio to Nebraska and from Kentucky to Minnesota can do it all, and yet feed the hungry as they do now.

GLUCOSE IN SORGHUM.

In searching for the reasons of the former failure to crystallize sugar from sorghum sirup, we find ourselves brought directly down to the chemical distinctions between glucose and sucrose, known in more common language as grape sugar and cane sugar. And with the difference in their composition we must meet also the different relations they sustain to the laws and the force of crystallization. We have long been familiar with the fact that cane sugar crystallizes readily, but that grape sugar in its ordinary states will not crystallize at all. We have also known that sorghum sirup was in chief part a solution of glucose in water, and that because of the presence of this uncrystallizable sugar we failed to obtain any crystals, though we were well aware that sucrose was also present. This may be fairly stated as about the extent of our practical knowledge, three years ago. The fact remained that no one could tell what a given lot of sorghum sirup would do; perhaps it would crystallize perhaps it would not.

In the special report No. 33 of the Department of Agriculture we have the "analytical and other work done on sorghum and cornstalks, by the chemical division of the department, July to December 1880." Dr. Collier, chemist of the department, establishes here certain points, from which we may make our own inferences. One of the chief objects he had in view was to ascertain the actual and the relative quantities of sucrose and of glucose contained in the juice of the sorghum during the successive stages of its growth. This was done carefully and continuously and with extreme accuracy. The laws of increase and of diminution were ascertained as fully as the work of a single season would allow, and in the report he was able to represent these results in a series of "graphical plates" which show at a glance the proportions of sucrose and of glucose at the dates given. One of these may serve for all very correctly, for though no two agreed fully, as might have been expected, yet all agreed in the main features, and they prove this succession of events.

Commencing in the late days of July, we see that the glucose exceeds the sucrose in quantity, but this condition ceases by about the first of August. From this time the sucrose increases rapidly though not uniformly, partial retrogressions occurring, of brief duration. When the seeds begin to harden, say about the middle of September, the increase is checked until the seed is nearly ripe; then it goes on, and at the full maturity of the seed it has reached its maximum, which it maintains with only at the most a small waste. This maximum is equal, as a schedule shows, to the average sucrose of sugar cane, and in some varieties goes decidedly above it.

While these changes have taken place in the amount of sucrose, precisely the opposite has been going on with the glucose. It has as steadily grown less and less, and at the time of maturity it has fallen to very nearly the average of the glucose of sugar cane, and in some varieties is even below it.

We have then this condition: when the sorghum cane is fully mature, its sucrose has reached its maximum and its glucose its minimum, and each of these is in about the quantity and the proportions in which it exists in average sugar cane. We may therefore infer that it will yield a return of sugar of equal weight and value to that of sugar cane, and will do it as surely and as readily. If this were absolutely true, we should have the key of the situation in our hands, but our sugar is not yet certain, though fortunately we are able to make it so. Sorghum juice is not sugar cane juice. It is unstable in its chemical character. Its sucrose, though so largely in the ascendency, has a strangely perverse tendency to take to itself another equivalent of HO_2 and thus become at once glucose. Unless this tendency is arrested every grain of available sugar may have disappeared, and probably will, within twenty-four hours from the commencement of the change, that is, from the time of the cutting of the sorghum. The transformation can be prevented by the use of lime, but practically this is best done by boiling.

Here then is the mystery laid bare; the key is now fairly in our hands. Perfect maturity of the cane, and prompt boiling of the juice; these are the two essential points. With them success is sure; without them we may expect failure; we shall have a glucose sirup and nothing else. Nor are these assertions made at random. Dr. Collier proved in the laboratory, it is true, the points which we have here seen, and it is scarcely possible to award to him too great credit for his skill and the truly practical results at which he arrived. But we can now go beyond him, to that which his researches have secured in actual field work. Sugar from sorghum cane has begun now to be a reality, and not as it was before, a *chance shot* only. The return is a matter of business certainty: as much so as that from sugar cane. We cannot here detail the crop reports of 1882, but they fully justify all the statements we have made.

It is easy to understand now the capricious character acquired by sorghum in previous years. It was merely a thing of chance, so to speak. Every now and then maturity and promptness would combine, and as a matter of course beautiful sugar showed itself; if either of these two were wanting, beautiful sirup was the only reward.

INCREASED SPEED BETWEEN NEW YORK AND LIVERPOOL.

After many sleepy years of slow boat employment the Cunard Company now begins to show hopeful signs of wakefulness to enterprise and appreciation of the public wants. During the past year it has put into service two new and splendid steamers, the Servia and Aurania, which are almost equal in speed to some of the fast boats long used on rival lines. The company has now made a contract with Messrs. John Elder & Company, of Glasgow, for the building of two additional steamers of a character and power far in excess of anything that has hitherto been devised for the Atlantic mail and passenger service.

They are to be vessels of 8,000 tons burden, and are to have engines of 13,000 horse power indicated, their dimensions being 500 feet long by 57 feet in breadth of beam, by 40 feet in depth of hold; and what is perhaps the most striking fact of all is, that they are to be guaranteed to steam at the rate of nineteen knots per hour, thus crossing the Atlantic, between Liverpool and New York, in less than six days. These two ships are to cost about three millions of dollars.

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NEW FORMS FOR BOATS.

Two boats have been recently chronicled in the papers which make in each case a decided departure from the old type, and we may say the stereotype, which has to a certain extent ruled all ship building from the day of Noah down. For much as models vary, they all seem to be planned on one principle—the boat must take *deep* hold of the water; and especially is this held to be true in the rough service of the open sea. In any one, for instance, of our splendid ocean steamers, her breadth of beam does not much exceed one-tenth of her length, and of course therefore her draught is so great that Sandy Hook scarce gives water enough to float her without watching for the tide.

Now, is this necessary? Are we bound to go on in the same way, or is it one of the nursery legends which have come down to us by inheritance, and with which, when we learn to go it alone, we can dispense? The two plans of boats to which reference has been made turn our attention toward this matter. The first one was evidently intended only as a pleasure boat, and to be of small size, but it was original in its design. It was to have the general proportions of a catfish, that is, the bullhead of Connecticut, or minister and bull pout of Massachusetts, the *Amiurus nebulosus*. This brings the bow broad and flat, the breadth carried very well forward, and gently rounded up only, while aft it tapers to a narrow waist and wedge like stern, with nothing there to make her drag water in the least. The greatest breadth, away out, quite near the bow, will be about one-fifth the length of keel.

What this peculiar build will do remains to be seen. It is certainly unlike any ordinary model, and it is much to be hoped that its results, whether satisfactory or not, may be made public. The trials which fail are of perhaps the most interest and advantage to every one except the originator.

In the other case there was not absolutely anything new. It was a small steamer constructed for a sugar estate on the Magdalena River, and to secure a sufficiently light draught her beam was about one-fourth of her length, with full bearings carried well fore and aft, yet without a really flat bottom, fine lines being her general characteristic. With a length of 54 feet her extreme draught is to be only two feet.

This for river navigation is nothing special. We all know the swarms of Mississippi boats built to "run anywhere that the ground is a little damp." But the peculiarity of this new craft is that she is to be run out to the Magdalena on her own merits, by her own power. And there is where the difficulty seems to come in, and so much so that the captain is guaranteed a special extra payment if he makes the trip successfully. It is apparently taken for granted that the long surges of the Atlantic, and perhaps in particular of the Caribbean, will pitch her about and drive her before them at such a rate that she can never give a good account of herself.

Because forsooth she does not go down into them, but floats lightly over them, they will knock her here and there like a bubble. Well, let them knock. What harm will it do? If she has strength to stand the run of the sea, why should she not be lifted easily *above* it, instead of having every timber wrenched and strained in the effort to come up *through* it?

No one can stand well forward and watch an ordinary steamship as she is plunging into a heavy head sea, and see her come rushing down a long swell through the trough, without being conscious of the terrible strain which comes upon her, as she buries herself in the next sea before she begins to rise. Her sharp bow cuts into it like a knife, and away down, down, she goes before her displacement is able to overbalance her weight and her downward plunge, and then eventually she lifts and goes over.

If now instead of this knife edge she had had the breadth forward which would have rendered impossible any such depth of submersion, whose amount of displacement would have sent her over the coming sea when instead of plunging thirty feet down into it she had hardly buried herself a fathom, what laws of hydrodynamics will show that in this latter case a decidedly important part of the strain upon her timbers would not have been avoided? We are perfectly well aware that we shall at once be told that all this question of bluff bows and sharp bows has been settled years ago, that every one knows sharpness and speed are but convertible terms, and that for sea going craft the deep keel or its equivalent is indispensable. Very good! Perhaps all this may be so, and then again perhaps it may not. We are entitled to our own free judgment, and some time by and by we may give the reasons for what we believe as to it. A.

FAITH REMEDIES.

It is unnecessary to resort to some collection of anecdotes relating to old-time superstitions to show how great an influence faith or fancy may have on the human mind, and act through the mind on the body. The faith cures which are a portion of our current news are supplemented by practices by sensible people which are considered by them to be of such an occult or doubtful nature as to be concealed, usually, for fear of ridicule. It is not uncommon now for persons to wear around the neck a suspended miniature sachet of silk containing gum camphor as a defense against fevers, measles, and small pox. A string of red coral beads, or in lieu thereof a bit of scarlet yarn about the neck, is even now considered a necessary protection of the infant from various ills. Some persons who are periodically afflicted with rheumatism carry either a small potato or a horse chestnut as a charm against the attack of the dreaded foe. This sort of nonsense is not confined to the vulgar or ignorant, for in at least two instances one was a doctor of divinity and the other a man of liberal education and cosmopolitan experience.

The cure of warts has always been associated, more or less, with the occult or unknowable. A pleasant mannered young woman who made no pretensions to unusual skill and medical knowledge, was for years the resort of all the wart-afflicted in the town and vicinity. Speaking from youthful memory, what she did was to take the number of the warts given her by the patient or an accompanying friend, and that was the sum and substance of the prescription. There are plenty of her patients, however, who will swear that their visit to the quiet little dressmaker was followed by the rapid disappearance of their warts. There are reasonable and sensible men living who will aver that they cured their warts by stealing, unobserved, a bit of fresh meat, rubbing it on the warts, and burying it in the ground. In cases of threatened tetanus, caused by a foot wound, the drinking of water in which vinegar-rusted nails have been stirred was formerly adjudged to be a specific, and there are persons who will readily give testimony to this effect. In this case it is not impossible that the iron tonic may have been advantageous.

It may be difficult to draw the line between the effect of medicaments on the human system under certain known laws and the mental influence of belief and desire on the physical body. Whether mental emotion or intelligent faith does really affect the animal portion of the human structure or not, it is a curious fact that education and culture do not eliminate a belief in faith cures or remedies.

SOLAR MACHINERY.

No reference is made here to the machinery by which the sun is run, but to the machinery to be run in the future by the sun. Yes, we are speculating again as to those wasted powers of nature which we have had under consideration several times of late. The idea of allowing any force which we can use without expense to escape our grasp is exceedingly unpleasant, and yet we are doing it constantly. We have glanced cursorily at one: it will do no harm to call up another. May be some good may come of it.

The use of wind power is an indirect application of solar heat to the moving of machinery; why should we not use that heat directly instead of mediately? We have learned to harness the lightning to our car; we have just as good a right to yoke in the sun's rays, and not merely take pictures with them, but send our spindles flying and our cars rolling forward by their power. There is nothing new in this. The thought has often been suggested and the attempt made, and it is partly to take note of what has been already done, and partly to look a little away ahead, that we bring up the subject now.

The direct rays of the sun in one of our hot, or even common, summer days strike with so much energy, and in fact cause us so much suffering by their intensity, that no one would think of questioning the assertion that were they concentrated, say only four or five fold, on a proper receptacle, its contained water would boil with violence, and steam for mechanical uses be generated abundantly. But those days are relatively, in our latitude, of small number, and on any one of even this number clouds are liable to intercept the brightness and the burning heat.

Still, there are regions in which the heat is always great, and where clouds are rare, and it is in those that the greatest benefits are easily available, and it is to those that attention has hitherto been chiefly turned. But alas! those are not the regions in which power is mostly needed. They are not where the cotton mill is playing with its looms and spindles, or where the planer and the lathe ask for hundreds of horse power behind them to give them life and activity. On the dreary wastes of Nevada, Arizona, etc., you may feel the fiery heat of the sun scorch your face before his disk has risen half its diameter above the edge of the desert, and then that heat increase hour after hour with fearful force. And still further, you may watch week after week, and month after month, and never see a cloud such as the prophet saw, "like a man's hand." Solar engines might indeed seem easy of construction there, but—*cui bono?* Jackass rabbits and horned frogs are all the life that is visible to you as you sit and rock to and fro in your scorching saddle the whole day through.

And that is too much the condition of most of those sun-favored lands. But there are exceptions. Ever since the French have have had possession of Algeria, they have been favorably situated for working out the very problem we have before us. Nor have they been idle. For years experimental work has been going on, and some very interesting and to a certain extent satisfactory results have been attained. The same thing has been done in British India, though they have less of cloudless sky than in the African regions, and apparently not as good progress has yet been made.

The prevalent idea in all trials thus far has been to utilize the direct rays of the sun by concentration through the agency of reflectors. This perhaps will persistently remain the most available means, as it certainly has the great advantage of cheapness of apparatus. Were it not, however, for the great expense of the instruments, convex lenses would demonstrably accomplish very much more work within a given space than has ever yet been achieved with reflectors. Will not some inventive soul set himself to this task of devising some way of constructing lenses of great size at a moderate cost? We shall see a use for them as we go on later to look at the possibilities of solar energy, even for our cool and cloudy regions. No absolute degree of perfection in their form is requisite; nothing like achromatic conditions; only the power of concentration to a moderate focus, though of course the sharper and more definite the better. It is even probable that polygonal surfaces, without curves of any sort, may be made available, and if so, great diameters may be easily reached. This is a thing well worth investigation practically, as we will see.

The results in Algeria have led to a practical trial being made, not under the scorching sun of Africa, but further north even than we are, in the Garden of the Tuileries, Paris. It was on the 6th day of August of last year. The apparatus of M. Pifre, of Algeria, was adapted for use in the French capital. A reflector in the form of a hollow cone, three and one-half meters in diameter, was used to concentrate the solar rays on a vessel for the generation of steam. This steam drove a small printing press, and though the day was not hot, and clouds frequently obscured the sun, the press ran steadily from one o'clock till half past five, and printed on an average five hundred copies of the *Soleil Journal*, a paper specially prepared for the occasion. The cross section of the reflector of course comprised a little over a hundred square feet, and the power secured from this under these circumstances is indicated by the work stated above.

This is not by any means an insignificant showing. It is true no great results will be manifested from it for some time to come, but the future possibilities are there, and by and by they will be worked out. A.

Fermentation of Baker's Dough.

It has hitherto been supposed that the fermentation of bread dough set up by sour leaven, or beer yeast, was a real alcoholic fermentation. We learn from a paper in *Comptes Rendus*, that G. Chicandard has investigated the subject microscopically. He found that the *Saccharomyces cerevisiæ* put into the dough very soon disappeared and numerous microbes, which he took for bacteria, made their appearance. These bacteria multiplied with great rapidity on the yeast in dough, and they can be cultivated in water containing yeast. Hence he concludes that the beer yeast favored the growth of these microbes. An analysis of the gases evolved during fermentation proved the presence of 70 per cent of carbonic acid, while the rest consisted of hydrogen and nitrogen. The composition of these gases is similar to those formed by the putrefaction of albumen.

From this it would appear that the fermentation of bread does not consist in liquefying the starch by alcoholic fermentation, but in the conversion of one portion of the insoluble albumen of the gluten first into soluble albumen and then into peptone. Starch is first decomposed by heat in the process of baking, forming soluble starch and some dextrine. The cause of the fermentation is, however, a bacterium.

Nitrogenous Ferments in Human Milk.

Bechamp has published a paper in *Comptes Rendus* on milk, in which he says that cow's milk contains two distinct albuminous substances besides caseine. One of these remains insoluble in alcohol after it has been precipitated by alcohol, and is an enzymotic substance which possesses the power of liquefying starch without first converting it into sugar. Dumas and Cahour have already proved that the enzymotic constituent of woman's milk possesses much greater power than that of cow's milk, nearly equally to diastase.

Bechamp isolated the enzyme by the following process: normal slightly alkaline woman's milk was carefully acidified with acetic acid, aad then at least three times its volume of 95 per cent alcohol was added. The very bulky precipitate was collected on a filter, washed with weaker alcohol to remove the milk sugar, then with ether to remove the fatty portions, and then taken up with distilled water. After a few hours it is filtered. The solution thus prepared possesses to a high degree the property of liquefying starch and converting it into sugar. Twenty or thirty cubic centimeters of milk are sufficient to prove this assertion.

Another Valuable Life Ended.

Many persons who have had dealings with Messrs. Ellwagner, the extensive florists and rose growers at Rochester, will regret to learn of the death from typhoid fever of Mr. Henry R. Ellwanger, after a four weeks' struggle with the disease. Although but thirty-three years of age, Mr. Ellwanger had become the acknowledged authority on the subject of roses in the United States. He was the author of a work entitled "The Rose," published last year, which established his reputation, and the *Century* for July contained an illustrated article entitled "Old and New Roses," which has attracted wide attention. This was the young man's last work.

Adamascobite.

Adamascobite is the local name of a mineral which is said to be found in only one place in the world, and that is the State of Missouri. The stone is very peculiar in its structure and properties. Its cutting power is diamond-like, cutting away steel very rapidly, and still retaining an exceedingly fine edge.

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IMPROVED FIRE-HOSE NOZZLE.

The engraving shows a novel and ingeniously contrived spreading or spraying nozzle for fire-hose, which is capable of throwing either a solid stream of water, or of breaking it up and spreading it so that it will cover a great surface and produce a sudden lowering of the temperature by the evaporation of water spread over the heated surface, and thus extinguish the fire without deluging the building with water. It is a notable fact that in many cases of fire the water used to extinguish the flames works far greater injury than the fire itself. It is to avoid this trouble that the nozzle shown in the engraving has been devised.

The double pointed levers shown in the larger cut are capable of being thrown into the stream of water by simply turning a movable collar. By this means the stream may be instantaneously changed from a more or less solid one to a spray which spreads out and covers a large area. This spray serves as a great protection to the pipe holder, and will enable him to approach very near the fire and produce effects which would be entirely impossible with the common nozzle.

Any one familiar with the principle upon which fire is extinguished by water will see that water applied with a nozzle of this kind would be far more efficient than a solid stream.

For steamboats and factories this nozzle, used in connection with an efficient force pump, would prove a valuable protection against fire. We are informed that the nozzle has been thoroughly tried by experienced firemen, and has proved itself to be very efficient.

Further information may be obtained by addressing the inventor, Mr. Charles Oyston, Little Falls, N. Y.

Automatic Printing of Light Signals.

BY M. MARTIN DE BRETTES.

Every printing apparatus, in order to act, requires the mechanical work of a force which is manifested to the purpose, that is to say, when and how the sender of the dispatches wishes.

This small force is required for the magnetization of an electro-magnet, and the mechanical work serves for the attraction of the keeper, the movement of which determines the action of the apparatus.

In order to solve the problem of printing telephotic dispatches at the receiving station, the light projected must have the power of producing there, during its continuance, which depends on the will of the sender, the magnetization of an electro-magnet, forming part of a local battery, or an augmentation sufficient for it to overcome the opposing spring of its keeper.

The illuminated part of the circuit of the battery must consequently be composed of a body endowed with the property of becoming suddenly conductive under the influence of light, and of ceasing to be so when the light is withdrawn. There exists, as is known, a body which possesses this property in a very high degree, namely, selenium.

The electric light produced at the receiving station in a Mangin's projector is sent there as a bundle of parallel rays, and received upon a converging lens, at the focus of which is fixed the selenium element forming part of the circuit of the local battery, which contains the coil of the electro-magnet moving the receiver.

The impression of the jets of light in black marks, long and short, according to the Morse alphabet, is made with the Morse apparatus. The jets of light are transmitted by the movement of a simple lever which displaces a screen. The printing of the dispatches in ordinary type is effected by means of a Breguet frame receiver, the needle of which is replaced by a type wheel, and to which is added a printing mechanism, which acts by means of a special battery, and only when it is wished to print some given letter.

The distance between two stations depends on the transparency of the air, on the latitude, and, all other things being equal, on the quantity of light received per unit of surface when the luminous rays are parallel. The law of the decrease of the intensity of light in this case is not known; but it depends solely on atmospheric absorption, for in a vacuum the intensity would remain constant. We cannot determine *a priori* the distance of the two stations for a given electrical focus; recourse must be had to experience.

The fine experiment of M. Fizeau for determining the speed of light shows that the distance of two stations might be considerable with the modern powerful electric lights which exceed 2,000 carcels.

We know, in fact, that in these experiments the light of a lamp gave after a course of 17 kilometers a brilliant focus of very appreciable intensity.—*Comptes Rendus.*

IN New York city there are 486 miles of water pipe, 391 of sewer pipe, 824 of gas pipe, 14½ of steam pipe, and 15 of underground electric wire.

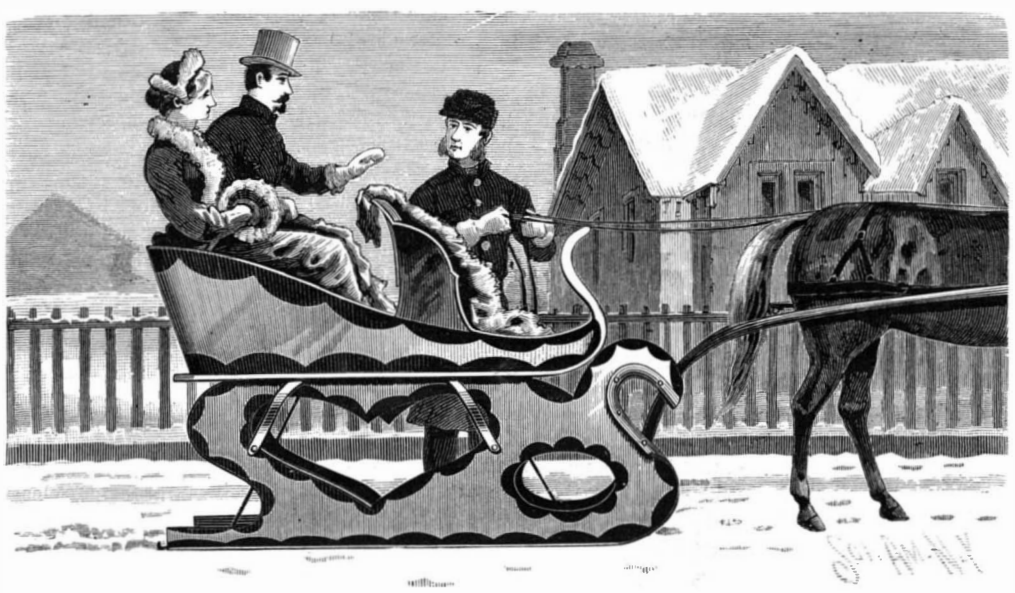
River Obstructions, New York.

The great explosion at Hell Gate, in September, 1876, under the supervision of General Newton, did much to improve the channel from Long Island Sound to New York city. But there is another obstruction to be removed before the passage can be made wholly safe—Flood Rock, in the East River, off Ninety-third Street. General Newton thinks that the sum of $500,000 will be required on this work for the next year

OYSTON'S FIRE-HOSE NOZZLE.

IMPROVED SLEIGH.

The sleigh shown in our engraving is made after a design patented by Mr. Geo. Edward Watson, of Bismark City, Montana. The novelty consists in the peculiar form of the runners and in the ornamentation of the runners and body.



WATSON'S IMPROVED SLEIGH.

The forward ends of the runners are in the form of a goose neck. There is in each runner a heart-shaped opening and an oval opening, and these openings, as well as the outer margins, are ornamented with color scallops, which contrast with the color of the main portion of the sleigh.

The goose neck at the front of the sleigh is designed to be adjustable, and is to be terminated in a swan's head or in any other ornamental figure that the fancy of the manufacturer may dictate.

The back seat is adjustable, and is fastened by means of hooks on the inside.

Further information in regard to this invention may be obtained by addressing the inventor as above.

The Country's Mineral Products.

From advance sheets of the "Mineral Resources of the United States," a report by Albert Williams, Jr., Chief of the Division of Mining Statistics, U. S. Geological Survey, a number of interesting facts are taken relating to the amounts and values of the mineral substances procured by labor in the United States during the year 1882, and estimates of the amounts during the first half of 1883.

In value coal heads the list, which comprises anthracite, bituminous, brown coal, and lignite, and it amounts to $146,632,581, of which nearly one-half is that of Pennsylvania anthracite. Pig iron ranks next, its value being $106,336,429, to which may be added the value of chrome iron ore, at Baltimore as a market, $100,000. Of silver, ranking next to coal, there was mined in 1882, $46,800,000, and of gold $32,500,000. The other metallic ores produced were copper, lead, zinc, quicksilver, nickel, antimony, platinum, and tin. Of platinum the total value was $1,000, and of tin the quantity was so small that no valuation is made of it. The total value of the metallic products of the country for 1882 was $219,756,004.

In the non-metallic products the one ranking next after gold in value is crude petroleum, $23,704,698; then lime, $21,700,000; building stone, $21,000,000; salt, next in value to building stone, is only $4,320,140. The total value of non-metallic substances, including clays, buhrstones, grindstones, lithographic stone, and other substances entering into manufactures, is $453,912,406.

Judging by the estimates made for the first six months of 1883, the value of iron produced is somewhat less than that of an equal period of 1882, the total local or "spot" value of iron and steel in the first stage of manufacture for 1882 being $171,336,429, while the estimates for the first half of 1883 are only $71,000,000, equal to $142,000,000 for the year. But this comparison of market values will be modified by the fact that the price of iron has been less in 1883 than in 1882, a difference of something over three dollars a ton.

Gold and silver were produced in increased amounts in 1882, the additional value over the product of 1881 being $1,600,000. For the first six months of the current year the production of petroleum has been 11,291,663 barrels, against 30,053,500 barrels in the previous twelve months. In copper there has been an increase, the estimate for the first six months of 1883 being 58,000,000 pounds, against 91,646,232 pounds in 1882.

A slight increase in the amount of lead mined is estimated for the present year, and also in zinc; but as these estimates are based on increases in former years, and not on actual statistics, they may be taken with some allowance.

Steel for Heavy Shafts.

An engineer at a meeting of the Society of Engineers at Aix-la-Chapelle gave some facts in regard to the qualities of mild steel for heavy forged work that tend to modify the growing confidence in that material as compared with iron. He said that a Bessemer steel shaft of a high speed engine belonging to a rolling mill broke suddenly while the engine was moving slowly. The shaft was replaced by one of iron. In an engine works on the Rhine a steel shaft of 15¾ inches diameter broke, and inside was found a hole large as a man's fist containing two steel balls that during the two years of the shaft's rotation had been worn quite smooth. Another engineer said that in casting steel ingots it is more frequent to have a porous casting in mild steel than in hard steel. If steel ingots have incomplete, hollow, or porous spots, these do not become welded together by further heating and working, but, after being rolled thin, they retain their porosity, as unwelded spots are retained in wrought iron. As these porous places are generally in the center of the ingot, the round bars, the piston rods, and axles made of it have also usually an internal weakness, which it is difficult to set right in the working, and which may cause breakages in the future.

In the course of the discussion it was shown that steel that hardened on the surface on sudden cooling ought not to be deemed mild steel, and was treacherous in its character. No material capable of considerable hardening should be called iron, and, if narrowly examined, it will be seen that a great deal of the ingot iron specified as "incapable of considerable hardening," is nevertheless capable of very considerable hardening under certain circumstances, such as a sudden cooling of a heated shaft. This "inconsiderable hardening" is just sufficient to shrink the surface, produce tension, small cracks, and finally breakages.

AN ingenious mechanic of Jamestown, N. Y., has constructed a perfect locomotive, said to be the smallest in the world. The engine is only 8½ inches long. The pumps throw a drop of water per stroke. As many as 585 screws were required to put the parts together. The engine itself weighs a pound and a half, and the tender two pounds and a half ounce. The mechanic was at work upon the locomotive at intervals for eight years.

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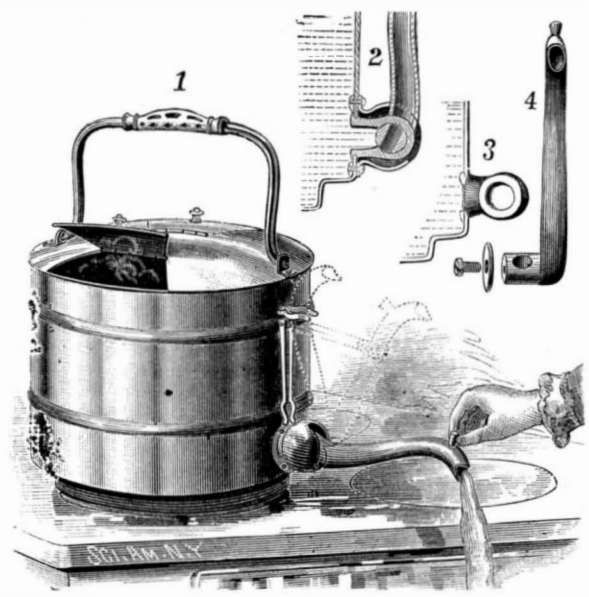
IMPROVEMENT IN TEA KETTLES.

The engraving shows a tea kettle embodying novel features which render it very convenient, and obviate the necessity of lifting the kettle whenever it is desired to pour water from it. The kettle has a faucet spout which is closed entirely when in a vertical position, is entirely open when in a horizontal position, as shown in the engraving; and when placed in an inclined position, it is open like the spout of an ordinary tea kettle, but the elevation of the spout prevents the water from flowing out.

Clips are provided for holding the spout in the vertical or inclined position. Fig. 2 of the engraving is a vertical section of the spout, showing the faucet connection closed; Fig. 3 shows the body of the faucet, and Fig. 4 shows the spout with the faucet plug attached.



SCHOENING'S IMPROVED TEA KETTLE.

In addition to these improvements in the spout, the tea kettle has side covers at the top, each provided with a knob of non-conducting material. This arrangement of covers prevents the steam from escaping in such a way as to burn the hand when grasping the bail. The bail when in a horizontal position rests on one or the other of the cover knobs, and is thus prevented from becoming heated. The spout is provided with a knob of non conducting material, by means of which it is raised or lowered.

This improvement is the invention of Mr Charles J. Schoening, of 557 W. Chicago Street, Chicago, Ill.

Effects of the Electric Light on the Air in Theaters as Compared with Gas.

Prof. M. Von Pettenkofer has been making some experiments with regard to the temperature and quality of the air in buildings lighted with electricity and gas respectively. The investigations were made in the Royal Residence Theater in Munich. The increase of temperature was ten times as great in the upper gallery when gas was used to light an empty house as when it was illuminated by electricity. In the former case the temperature rose 16½° Fahr.; in the latter only 1·6°. In the lower part of the house there was naturally less difference. With a full house the difference was 10·8° Fahr. (6° C.); the temperature of the gallery being 84° Fahr. with gas and 73° Fahr. with electricity. The temperature was not as high in the third balcony with the electric light as in the first with gas lights

The amount of carbonic acid was also determined. With an empty house, where all the carbonic acid came from the lamps, there was the same difference as in temperature. At the beginning there were 4 parts in 10,000 of air in the auditorium. With gas light this had increased in half an hour to 5 parts in parquette, 11 in first balcony, and 20 in the third. With electricity it was 4 at the start, and in half an hour 5 in parquette, 5 in first balcony, and 6 in third balcony. If, as Edison claims, electricity produces no carbonic acid, this slight increase must have come from the lookers-on and laborers on the stage.

In a full house we might have expected the same difference, but this was not the case. With five or six hundred people in the theater the maximum amount of carbonic acid was 23 parts in 10,000 with gas light, and 18 in 10,000 with electric light.

There are many causes for this apparent contradiction. The changes of scenes and scenery cause uncontrollable changes of air on the stage and in the theater; it also depends on the frequent opening of the box doors, etc. The large amount of carbonic acid present in an occupied theater, even with electric lighting, must be attributed to insufficient ventilation.—*Correspondence of Chem. Zeitung.*

THE whistle of a locomotive is heard 3,300 yards, the noise of a train 2,800 yards, the report of a musket and the bark of a dog 1,800 yards, the roll of a drum 1,600 yards; the croak of a frog 900 yards, and a cricket's chirp 800 yards.

Expert Testimony.

It is questionable how far technical knowledge on the part of a judge is advantageous to the suitor. A judge who is specially informed, or a counsel specially qualified, in any particular branch of scientific or technical knowledge is apt to take for granted a knowledge on the part of others which they do not possess, and to neglect careful investigation where it might be useful in enabling him to arrive at the truth. The skill of the counsel lies more in his power of extracting information from the witnesses than in the use of any special knowledge of his own with regard to the subject in dispute. The ability of the judge is best seen in the use to which he puts information so placed in possession of the court. Strange though it may appear, a technical knowledge on the part of the judge is rather apt to bias or weaken his judgment than to assist him in arriving at a correct conclusion.

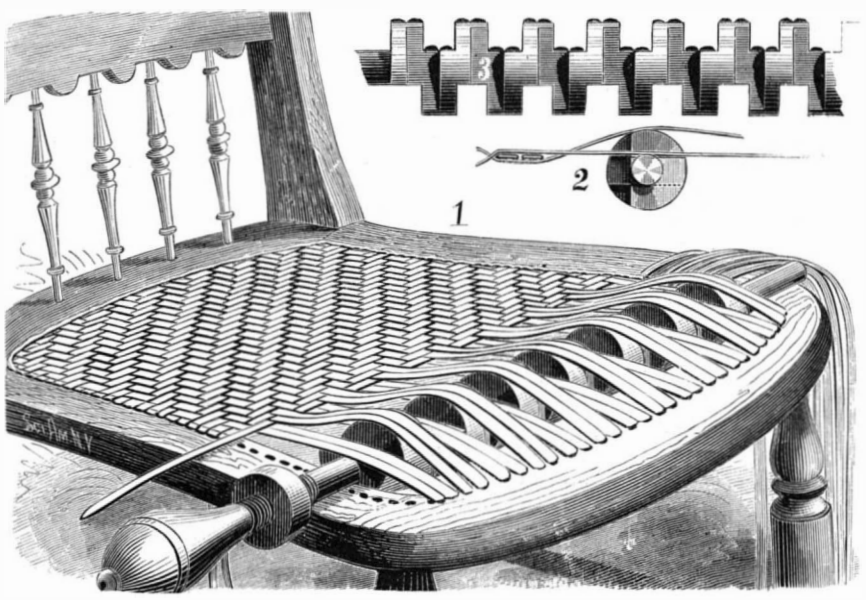
Mr. Justice Stephen appears to prefer the evidence of his own eyesight to the testimony of expert witnesses, and in a "light and air" case tried in London the other day, which we find reported in the *Architect*, he adjourned to view the premises where the light was alleged to be obstructed. He seems to have personally formed a speedy judgment in the case, and to have given a verdict accordingly for the defendants. The judgment was no doubt sound and the decision right, but if a judge does not rely on the evidence of experts in these matters, the suitor may be spared the expense of calling them. Judges of the Chancery Division have recently adopted a plan of appointing or selecting a skilled witness to report to the court independently of the parties to the action, and the plan has been hitherto successful. We are unaware of the amount of technical knowledge possessed by Mr. Justice Stephen in "light and air" cases, but it may be doubted, adds our contemporary, whether the learned judge had a proper opportunity for forming a sound judgment during the short adjournment of the court, when he inspected the building Our judges, moreover, will find abundant and varied occupation if this practice of inspecting the *locus in quo* is generally followed.

CHAIR SEATING NEEDLE.

This chair seating needle is designed to facilitate the seating of chairs with a plaiting of cane or other material.

The needle has rows of alternating spaces and notches with end journals, either or both of which are provided with a screw collar and with a handle, the object being to make a uniform diagonal plating.

When making double-bottomed seats, the warp or "first-way" is wound around the side bars of the seat-frame by hand, in the ordinary manner. A needle is then passed beneath the warp of the upper part of the seat, and another needle is passed above the warp of the lower part of the seat, the needles being held against the front and rear bars of the seat frame by the warp, and the needles being held from longitudinal movement by turning the screw collars up against the front and rear bars of the seat frame. The upper needle being arranged beneath the warp or first-way of the upper part of the seat, an opening or shed is formed in the strands of this part by some of the warp strands being elevated above the others by the high portions of the body of the needle, and through this shed a strand of the woof or "second-way" is passed, and is then pushed to the other side of the seat frame. The needle is then turned through one-quarter of a revolution, so as to raise other strands, and another woof strand is passed through, and so on until the woof extends to or nearly to the needle, which is then removed, and the remaining space is afterward filled out by hand in the ordinary manner. In this way a uniform diagonal plaiting will be formed, each strand of woof passing over two strands of warp and under two strands alternately.



LONG'S CHAIR SEATING NEEDLE.

A different needle is required for each different width of warp strands, the raised portions and the notches in each case being the width of two strands, except at each end of the needle, where they run out to the width of one strand.

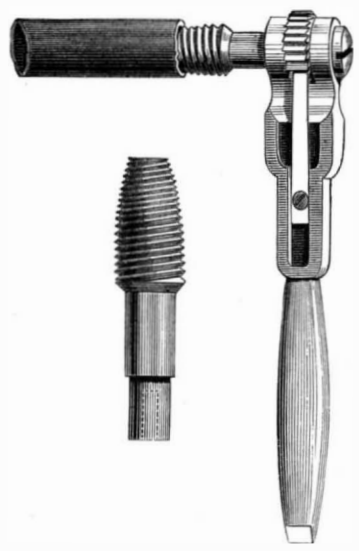
This invention has been patented by Mr. Charles R. Long, of Louisville Ky.

HEADLESS SHELL EXTRACTOR.

This is an implement for extracting broken cartridge shells from the chambers of breech loading small arms. The head of the ordinary metallic cartridge shell frequently bursts or is blown off, and the headless shell is very difficult to extract from the chamber of the gun, and in the attempt to extract it with ordinary tools the gun barrel and connected parts are frequently injured. By means of this tool such broken shells may be readily extracted without injury to the gun.

The invention consists of an extracting screw provided with a ratchet, a handle carrying a spring pawl and pivoted on the shank of the screw, and arranged to turn the screw. The end of the handle is a screw driver.

The inventor furnishes the following directions for operating the extractor:



PRATT'S SHELL EXTRACTOR.

Kneel on the left knee; throw the piece over the right leg, and open the chamber. Insert the end of the tap, at the breech, into the broken shell, pressing it firmly with the *left thumb*, working the handle with the right hand from *right* to *left* until the tap has a firm hold of the shell, and then rising, withdraw the shell from the breech. Lock the ratchet wheel of the extractor by means of the latch, and holding the shell with the *left hand*, turn the extractor to the left, which will loosen the shell from the extractor.

In case the shell should be so firmly fixed in the breech as not to yield to a strong pull, insert the head of the ramrod through the muzzle, and push it against the shell, which will dislodge both shell and extractor.

This invention has been patented by Mr. William Pratt, Regiment Armorer, 7th U. S. Infantry, Fort Laramie, Wyoming Ter., to whom all communications should be addressed.

Autographic Reproductions of Fossils.

Mr. Fayol recently exhibited at the reunion of engineers of Saint Etienne, a number of autographic reproductions of fossils, and explained the process of obtaining them:

(1) By means of an inking roller, printing ink is spread over the object to be copied. (2) Upon the inked object there is laid a sheet of ordinary white paper slightly moistened, and this is then pressed down with the hand or with a small pad. Such is the simple and expeditious process by which were obtained the autographic reproductions of leaves, insects, medals, lace, and fossils represented in the plates shown at the reunion.

These plates were lithographs that had been made in the following way: For the ordinary white paper that is used when merely an impression is desired, there was substituted what is called *autographic paper*. This latter permits the impression to be transferred to stone by a process opposite that which served to take an impression of the fossil. On sending to the printer the impression on autographic paper, which any one can take, the printing costs ten francs per one hundred double plates, or five centimes per single one. As for equipment, all that is necessary is an inking roller, printing ink, and autographic paper, all of which may be procured of the printer. The total expense cannot exceed six francs. Most of the coal fossils could not be inked directly without injuring them, and to preserve them they are previously covered with a layer of silicate of potassa. The sirupy silicate of potassa (water glass) found at drug stores is diluted with water, and the fossil is then soaked in it. The imperceptible layer of silicate preserves and even brings out with greater sharpness the slightest shades and the most delicate lines. After drying, the inking may be done without trouble; and, after the impression has been taken, all traces of the ink may be removed with spirits of turpentine.

A MAN breathes about eighteen times a minute, and uses 3,000 cubic feet of air per hour.

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HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY.

In the fall of 1857 a club composed of young men interested in science and mechanics was organized in Hartford, and was known as the Polytechnic Club. Among its members were E. K. Root, E. M. Reed, Horace Lord, Charles B. Richards, Charles F. Howard, J. M. Allen, Francis A. Pratt, Joseph L. Blanchard, Amos Whitney, and J. A. Ayres. The object of the club was to discuss the scientific and mechanical questions that were interesting the public from time to time. Tyndall's "Heat as a Mode of Motion" was just out, and the Richards indicator was beginning to attract attention; the Giffard injector had recently been brought to this country, and was interesting scientific men by its paradoxical performances. The question of running steam cars up steep grades, and the use of the screw propeller in place of side wheels for propelling steam vessels, were warmly discussed by mechanical and civil engineers. These and other similar matters furnished topics for the discussions of the above named Polytechnic Club, but this club did not confine itself to the discussion of matters that were before the public and commented upon by the few scientific and mechanical journals of the day. It sought suggestions and topics from its own members, and among these contributions was that of "Guaranteed Steam Boiler Inspections."

It was argued that a sound and substantial corporation, that carefully inspected steam boilers and guaranteed the owners against loss or damage arising from explosions, would be a valuable help to manufacturers and beneficial to the public generally. This was the inception of the idea of boiler inspection and insurance in this country, if not in the world. The exciting days preceding our civil war speedily followed, and shortly the war broke upon us. The Polytechnic Club disbanded, and nothing more was heard of steam boiler inspection and insurance until the war was over and business had settled down into its former peaceful channels.

In the early part of the year 1866 the question of organizing a steam boiler inspection and insurance company was discussed by prominent manufacturers and others in Connecticut and Massachusetts. Among these were Richard W. H. Jarvis, President of Colt's Patent Firearms Manufactory; Charles M. Beach, of Beach & Co., of Hartford, Conn.; George Crompton, of the Crompton Loom Works, of Worcester, Mass.; and H. H. Hayden, Esq. It resulted in securing a charter for such a corporation from the State of Connecticut at the May session of its General Assembly in 1866, the name of said corporation to be

THE HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY,

its object being to inspect steam boilers and insure the owners against loss or damage arising from boiler explosions. The company was organized in November by the election of E. C. Roberts, President, and H. H. Hayden, Secretary. Mr. Roberts retired from office the following July, and in October, 1867, J. M. Allen was elected President, and H. H. Hayden was re-elected Secretary.

The company's early operations were small; the idea was new, and struck many people as ridiculous. The company had all the discouragements incident to the introduction of a new business and the development of a new idea; but by honest and intelligent work it gradually gained the confidence of the steam using public, and to-day has not less than 18,000 boilers under its care, and employs 42 trained inspectors, who are constantly engaged examining this large number of boilers. But this is not all; the company furnishes plans and specifications for boilers, boiler settings, and chimneys (for its patrons). Many of the large manufacturing establishments of the country have had their boiler houses, boilers, settings, piping, and chimneys laid out and arranged and insured by this company, with most satisfactory results. It has confined itself to the one business of the proper construction, setting, care, and management of steam boilers and their surroundings, studying the quality and character of material best adapted for their construction; also the inspection of boilers already in use, with a view to greater economy and safety.

In the opinion of the officers and directors of the company this business should not be mixed up with a number of other kinds of insurance, but its efforts should be directed solely to the study and development of the best results in the use of steam power.

The company is not interested in any patent boiler or boiler appliance, nor in any boiler "purger;" it approves all attachments, however, that have been sufficiently proved by use to be advantageous. In connection with its office are an experimental room, a draughting room, and a chemical laboratory. In the latter, scale from boilers is analyzed, also water that has proved detrimental to the boilers in which it is used, with a view to recommending the proper treatment to overcome the difficulty. In short, the company aims to give its patrons the best advice possible for the safety of their boilers and economy in their use. The offices and several departments are illustrated on the first page of this paper.

The company has extended its operations until it reaches in its results from Maine to California, and gives a sense of security to owners and users of steam boilers impossible by any other means; for the company not only insures against financial loss from boiler explosions, but by a series of periodical inspections discovers defects and suggests proper management to prevent disaster. The company, through its inspectors and examiners, has contributed very materially to the accumulation of facts regarding the life of steam boilers and the causes of their wear and injury. A large fund of valuable information exists in the records of the company, and its examiners are selected in consequence of their practical knowledge as steam engineers. The "Inspecting Room," shown in the engraving, is a museum of steam boiler curiosities, defective tubes, improper riveting, unsafe plates, etc., teaching more in an hour's study to the engineer and boiler maker than could be obtained by months of study of text-books.

It should be borne in mind that the company by its guarantee has a direct pecuniary interest in every boiler under its care, hence the company is as much interested in preventing accidents as the owner of the boiler. The confidence which the manufacturers of the country have in this company is, no doubt, due largely to the fact that its advice is disinterested so far as the manufacture or sale of boilers or boiler appliances is concerned. It should be stated that Secretary Hayden retired from office, January, 1869, and Theodore H. Babcock was elected to fill the vacancy. In February, 1873, Mr. Babcock retired from the secretaryship to assume the duties of manager of the New York department, which office he fills at the present time. Mr. J. B. Pierce, formerly Secretary of the North American Fire Insurance Company, was elected Secretary in February, 1873. The present officers of the company are: J. M. Allen, President; General William B. Franklin, Vice-President; J. B. Pierce, Secretary; F. B. Allen, Supervising General Agent. Branch offices of the company are established at the principal manufacturing centers of the country.

Cutting and Setting Precious Stones.

BY A. WAGNER.

Crystalline gems, like diamond and topaz, are generally cut in such a manner as to have flat, smooth faces. Precious stones that decompose the light and thus produce a play of colors, are polished in such a manner as to heighten this effect as much as possible, which is accomplished by making a large number of small facets. The brilliant is an example.

Precious stones that do not crystallize, and are distinguished by play of colors, like the opal, or peculiar effects of light, like the cat's eye, are usually polished round or oval like a loaf of bread or a half of an egg.

Gems are set in two different ways, distinguished as a free setting (*ajour*) and band setting (*en cassette*). In the former the stone is exposed on all sides and only held by little clasps. All its properties, its fire, its play of colors, show to the best advantage here. Hence very valuable gems are never set in any other way. Flat stones that are set in rings are sometimes fastened on the edge so as to leave only the top and bottom surfaces exposed.

In the band setting the stone forms the lid of a gold box, and if the gem is transparent the upper surface is generally made flat and smooth, while the under side forms a low pyramid.

In those stones which receive a band or box setting, and are less valuable, the beauty of the stone is increased by lining the box with colored tin foil, the color of the foil corresponding to that of the stone. Thus, for example, a piece of dark yellow foil is placed under very pale topaz, a deep purple foil under a pale amethyst, and so on, so that the light reflected from beneath through the stone will have a deep yellow or violet color, giving the stone a much finer appearance than if it were set free.

When setting common stones in cheap goods, they do not take the trouble to line the box with tin foil, but merely give it a coat of some colored varnish. This method is not one to be recommended, for a stone that has the foil beneath it looks much handsomer.

In order to make a cheap article with genuine stones the following ingenious device is resorted to: Thin slips of some gem, as emerald, for example, are backed up with a glass of exactly the same color, and the glass likewise polished. By setting one of these double stones with the real stone outward and the glass beneath, the surface will, of course, exhibit all the properties of the gem, such as hardness, etc. These half genuine stones are known as "underlaid gems," or in French as "*pierres fines doublée*." When these underlaid gems are skillfully set, it is difficult even for the expert to distinguish them from perfectly genuine stones. But still it is easy to distinguish them by holding the stone before the eye in such a manner that the light reflected from the top enters the eye at an oblique angle; the surface where the stone and glass meet can be distinctly recognized by the difference in the refractive power of the two media, having the appearance of a crack or flaw in the stone. The public are frequently deceived by dealers who represent these underlaid stones as being perfectly genuine.—*Neueste Erfindungen.*

Eighty Years of Usefulness.

There is something encouraging to young mechanics in the fact that a distinguished member of the craft has just completed eighty years of useful life and is still busy. In effort he is a very young man, for he hopes beyond his accomplishments, and believes beyond his possibilities. This old-young man is John Ericsson, the designer of the first monitor—for so he will be remembered in this country and others. And yet he will be considered historically as an inventor of the locomotive, of a caloric engine, of a screw for the driving of vessels, and possibly as the orginator of a "destroyer" that may add greatly to our national defenses. Possibly his solar engine may also add to his fame; but he will be held in remembrance, by those who share his friendship, as a good man and pleasant friend.

John Ericsson was born in Sweden in 1803, his father being a mining proprietor. He was educated as a civil engineer and subsequently practiced his profession in England. There in 1829 he entered a locomotive in competition with that of George Stephenson.

In 1833 he first brought to public notice his caloric engine. In 1837 he constructed the first practicable propeller vessel, the Francis B. Ogden, and the disfavor with which this was received by the British Admiralty resulted in Captain Ericsson's departure for America in 1839. His record in America began with his first essay in war ship building, the Princeton, which was the first steamship ever built with machinery protected from shot by being placed below the water line. The story of the Monitor, which revolutionized naval architecture, is too well known to need more than a reference. For the last few years Ericsson's time has been chiefly devoted to the perfection of submarine attack, and his torpedo boat, the Destroyer, is the result of his labors in that direction.

An Excellent Ferrotype Developer.

Messrs. Spiller and Crook, after long experience, give the following as a good developer for ferrotype plates:

Water	1 ounce.
Sulphate iron	14 grains.
Saltpeter	10 grains.
Acetic acid No. 8	30 minims.
Nitric acid	2 minims.

some have added—

Sulphate of potash	10 grains.

A potassium collodion should be used.

The tones which this developer gives are of a metallic luster, resembling the daguerreotype.

Instantaneous Photographs.

The introduction within the past two years of the improved gelatine process, by which the time of taking photographs with dry plates has been reduced a thousand times, renders it an easy matter now to obtain with certainty excellent pictures of moving objects, and opens up a vast field of experiment for the scientific student. We lately received some excellent specimens of instantaneous work by Mr. G. G. Rockwood, of Union Square, New York, illustrating the principal proceedings at the opening of the great Brooklyn Bridge. Pictures of frigates covered with flying flags, sailors manning the yard arms, and cannons firing from the same ships are among the pictures, and convey to the mind an idea of the extreme brevity of the time in which the impression must have been made on the sensitive plate. We are informed that the camera was located upon a steam tug, but the plate exposures were so brief that the vibration due to the machinery of the tug did not affect the distinctness of the pictures.

Mr. Rockwood has also produced a variety of beautiful photos illustrating the recent yacht races in the harbor. The several boats engaged in the race are shown in many various positions, going at racing speed, all photographed instantaneously; we have here marine pictures very artistic in finish, that show the form and motion of the waves, the spray, the bending of masts and sails to the wind, and all the circumstances of vigorous action sharply defined and naturally portrayed.

Tar as Fuel.

M. Le Treust gives some data relating to the use of tar as fuel in the Vaugirard Gas Works; the model followed being that of the tar furnaces of the gas works at Breme, designed by M. Servier. M. Le Treust mentions the disadvantages usually accompanying the use of tar as fuel, including the rapid destruction of the retorts, the extreme care necessary to maintain a regular flow of tar, and the liability to smoke. All these inconveniences are claimed to have been overcome by the arrangements perfected by M. Le Treust, which consist of a special form of injector, working in a furnace to which the air supply is regulated to a constant quantity. To insure fluidity, the tar used is taken directly from the hydraulic main. In order to utilize the great radiant power of the burning tar, the retorts of the setting of six are left as bare of brickwork is possible, being supported only on three narrow arches in their length, the middle of the setting being left void. Finally, the front wall is kept cool by the passage through it of the air required to support combustion. Eight settings of six retorts, working for a period of 434 days, carbonized 19,259,200 kilos. of coal, and consumed 2,345,750 kilos. of tar; being 675 kilos. of fuel per bench per day, or 12·17 kilos. of tar per 100 kilos. of coal carbonized. From these figures M. Le Treust concludes that tar firing is as good as coke, since the production of gas is as large, the retorts last as long, and the consumption of fuel is only 12 per cent of the weight of coal carbonized.

THE *Lancet* believes the naked electric light is fatal to the eyes. It is too hard; the "waves of motion are too short, and the outstroke joins the instroke at too acute an angle." To remove this defect a small convex reflector is placed below the light in the protecting globe, and one of larger size above it to secure a double reflection with ultimate divergence downward and outward, causing the rays to fall upon objects within the area of illumination.

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The Alloys of Gold.

Gold is capable of combination with many of the baser metals; and while its appearance can hardly be said to be improved by the process, its value for various practical purposes is enhanced by the mixture of other metals.

Arsenic, on account of its volatility, can be combined with gold only in small proportions. If the mixture is attempted to be made by projecting metallic arsenic on gold in fusion in an open crucible, the arsenic, according to the quantity used, will be entirely or in great part dissipated, and the gold in consequence will remain entirely unaltered or rendered more or less brittle. If a small crucible containing gold be inserted into a larger one containing arsenic, and an inverted crucible be luted on by way of a cover, and the apparatus be heated strongly in a wind furnace, the arsenic will be raised in vapor, and the gold, being fused in this arsenicated atmosphere, will combine with a small portion of it. The alloy hence resulting is of a gray color, a coarse, granular fracture, and very brittle. A heat equal to that of melting gold is by no means necessary to effect this combination, for if a plate of gold is merely brought to a full red heat in an atmosphere loaded with arsenic, this latter will unite superficially with the gold, and the alloy hence resulting being very fusible, will trickle in drops from the plate, till the whole of it is thus arsenicated. This alloy is scarcely decomposable by mere heat, and at a high temperature the arsenic that is driven off carries a considerable proportion of gold along with it.

If antimony is mixed by fusion with either fine or standard gold in the proportion of even one-quarter of a grain to the ounce ($\frac{1}{1920}$ of the whole mass) the resulting compound is brittle, has a close granular fracture, with hardly any metallic luster, and its bulk will be found to be remarkably greater than would be deduced from the mean specific gravity of its ingredients.

Zinc forms with gold an alloy of a brass yellow color; in other respects its action on gold is very analogous to that of arsenic, when projected in quantity on melted gold, it is entirely volatilized; in the state of vapor it combines with gold and renders it brittle. Fine brass added to gold in the proportion of $\frac{1}{24}$ forms a pale yellow brittle alloy with a coarse granular fracture. The specific gravity of gold and zinc is somewhat greater than the calculated mean, where it forms $\frac{1}{12}$ of the mass. According to Hellot, an alloy of three parts of zinc and one of gold is somewhat malleable; and equal parts of the two metals form a compound which, though brittle, is susceptible of a very high polish, and is but little liable to tarnish.

Cobalt mixed with standard gold, in the proportion of four grains to an ounce, renders the color somewhat paler, and induces a slight degree of brittleness, but does not materially alter the specific gravity. When mixed with fine gold in the proportion of 38 grains to the ounce, the result is a pale yellow alloy, very brittle and with an earthy fracture.

Nickel alloyed with gold in the proportion of 38 grains in the ounce, produces an alloy of the color of fine brass, with a coarse grained earthy fracture, and very brittle; its specific gravity is less than the mean. If the nickel is reduced to eight grains in the ounce of standard gold, the alloy is only slightly brittle; and with four grains of nickel, the mixture continues perfectly ductile.

Gold may be alloyed with manganese by calcining the black oxide of this metal repeatedly with oil in a covered crucible, and then exposing it to a very high heat in contact with gold. The color of the alloy thus produced is a reddish gray; it is capable of receiving a brilliant luster like steel; it is excessively hard, and is so far possessed of ductility as to be in some measure flattened by the hammer before it breaks. The proportion of manganese thus combined is from $\frac{1}{8}$ to $\frac{1}{5}$ of the alloy. The gold in this mixture defends the manganese not only from being oxidated by the air, but also protects it from the action of all those acids in which gold itself is insoluble. By long exposure to a high heat with access of air, the manganese rises to the surface of the gold, when it becomes oxidated, leaving this latter metal behind quite pure. These two metals may in like manner be separated by cupellation with lead, or by solution in nitric acid, if the alloy has previously been quartered with silver.

If gold is mixed with bismuth in the proportion of 38 grains to the ounce, the result is an alloy of a pale greenish yellow, excessively brittle, and exhibiting a fine grained earthy fracture; its specific gravity is somewhat greater than the mean. If standard gold is alloyed with even one-quarter of a grain of bismuth in the ounce, the mixture, although in color and texture reasonably standard gold, is yet perfectly brittle. So great is the liability of gold to be affected by bismuth, that if it comes in contact even with the fumes of this metal, and that not in close vessels, its ductility is entirely destroyed.

If lead is melted with gold in the proportion of 38 grains in the ounce, the alloy, though externally resembling pale fine gold, is as brittle as glass; is of a pale brown color internally; is wholly destitute of metallic luster, and has a fine grained porcelainous appearance; its specific gravity is a little less than the mean. When the proportion of lead is reduced to one-quarter of a grain in the ounce, the alloy is still perfectly brittle; and the fumes of this metal are nearly as prejudicial to the ductility of the gold as those of bismuth.

Tin, when mixed with gold in the proportion of 38 grains in the ounce, forms an alloy of a pale yellowish gray color, with a somewhat earthy fracture; it may be bent without breaking, but is very little ductile; its specific gravity is considerably greater than the mean of the ingredients. An alloy composed of 19 grains of tin, 19 grains of copper, and the remainder of the ounce gold, has a coarse grained earthy fracture, and is considerably more brittle than if no copper had been made use of.

Iron, either in the state of bar iron, cast iron, or steel, may be combined with gold to the amount of 38 grains, and probably much more, in the ounce, without in the least degree impairing its ductility. The color of the alloy is pale yellowish gray, approaching to dull white; it is considerably harder than standard gold, and its specific gravity is somewhat less than the mean of its constituent ingredients.

Platina and gold, when the proportion of the former amounts to 38 grains in the ounce, compose an alloy of a yellowish white color, like tarnished silver, perfect ductility, but much harder and considerably more elastic than standard gold. If to the foregoing alloy the standard proportion of copper is added, the compound becomes of a pale dull yellow, and its ductility is somewhat diminished.

When gold is rendered standard by copper, that is, when the proportion of this last amounts to 38 grains in the ounce, the resulting alloy is of a deep yellow color inclining to red, is harder than pure gold, but perfectly ductile. Its specific gravity is less than that of the mean of its ingredients in a remarkable degree. Equal parts of copper and gold also form a perfectly ductile alloy. It is not, however, every kind of reputedly pure copper which can safely be used for alloying gold; even the Swedish dollar copper occasionally renders the gold with which it is mixed as brittle as glass; this appears to be owing to the lead and antimony which most copper contains, and which, though not in sufficient quantity to affect in any material degree the ductility of the copper itself, are fully adequate to destroy the ductility of the gold with which they are mixed; since no more than $\frac{1}{1920}$ of either of these materials is enough for this purpose, as we have already mentioned.

Silver may be alloyed with gold in all proportions, and occasions hardly any perceptible alteration of the ductility, hardness, or mean specific gravity, the color of the mass becomes paler, exactly as the quantity of silver is increased.

The purple oxide of gold is employed as a material for coloring glass and porcelain. The old chemists vaunted greatly the medical effects of gold, but it has long since disappeared from every American and European pharmacopœia.—*Glassware Reporter.*

Incubation of Diseased Eggs.

Some observations in a field of experimental investigation hitherto but little, if at all, the subject of special research, were contributed by M. Barthélemy before a recent meeting of the Academie des Sciences. The conclusions at which M. Barthelemy arrives are remarkable, and may turn out to be of much value in throwing light on kindred questions. In a farmyard which had been during the past year the site of an epidemic of fowl cholera, a fowl presented this year, toward the end of February, all the symptoms of the affection, and after a protracted illness died. Fourteen eggs were laid by this bird during its illness, and these were subjected to incubation side by side with some eggs obtained from a normal fowl. Closely watched, the two kinds of eggs presented no recognizable difference so long as the circulation lasted in the yelk of the egg. Notable differences were, however, detected when the respiratory function was transferred to the allantois; this would be at about the ninth day of incubation. The addled eggs—if that term may be used—ceased to develop; not one was hatched. Examination of the eggs, opened with the usual precautions, showed that beneath the shell, and at the surface of the allantois, an extravasation of black blood existed, which was characterized by the presence of an odor quite similar to that arising from fowls dead of cholera. Pending the examination the umbilical artery continued to pulsate slowly, a fact which goes to show the tenacity of life of these embryos. The embryo proper was seen, so to speak, swamped in the bottom of the amniotic sac, which was swollen with a large quantity of fluid, while all trace of albumen had disappeared. The blood of the diseased egg was full of bacteria, and the amniotic fluid contained monads of very minute size. M. Barthélemy contends strongly for the notion that the ovum contained the germs of the microbes with which the parent's blood teemed, and that these germs only developed when, by the formation of the allantoid circulation, an aerial respiration imparted to the circulating blood the necessary amount of oxygen; it is of further interest to remark that just at this time the embryo begins to assume the special features of a bird. Two out of three fowls succumbed after inoculation with the *debris* of the diseased embryo. Lastly, it ought to be mentioned that cholera was still rife on the farm, and that other fowls were affected.—*Lancet.*

Pentelian and Parian Marbles.

Although Pentelian marble and all monuments made of it have at first a beautiful white and brilliant appearance, yet after a while, sometimes within a few months, sometimes not for years, they exhibit reddish-brown spots and stains, and marble columns of Pentelian marble gradually become covered with a reddish-brown film of oxide of iron. The color comes from sulphide of iron (pyrites) that frequently occurs in fine streaks in this marble and is oxidized in course of time by the action of air and water, and can then be recognized, very disagreeably, by their dark color. The spores of cryptogamous plants, such as fresh and salt water algæ, germinate in these red streaks. The new Academy at Athens was built of such Pentelian marble, and while hundreds of the blocks used still remain perfectly white and will probably remain so a long time, others already show yellow, brown, and even black spots.

On the other hand, Parian marble, from which the old sculptors Praxiteles and Phidias chiseled their statues, has the property of remaining always white, because it contains no iron. Both kinds of marble have this excellent quality, namely, that they do not weather, lose their luster, and look like the shells of boiled eggs, as is the case with Carrara marble.

The name of marble, from its Greek derivation, signifies a stone that glistens on the broken or fractured surfaces.

To impart to new marble the appearance of old, which is necessary in repairing injured antiques, it may be painted over with a very dilute solution of chloride of iron, whereupon the new pieces acquire a fine yellowish-red color, similar to that produced by the influence of air and water for centuries upon the old marble.—*Austro-Hungarian Journal.*

A Locomotive in a Procession.

At Austin, Nevada, on July 4, the public procession contained a locomotive and two flat cars which moved in a stately way through the main street, the cars being decorated and fitted for the display of emblematic devices and carrying young women representing the States, and symbolizing virtues, sciences, arts, and trades. The grade of the railroad which passes up through the main street of the town from the station of the Nevada Central is 12½ feet to the 100, and being on the natural route of the procession, the locomotive and cars were utilized to most excellent and peculiarly effective advantage.

A correspondent says that all went smooth and easy enough going down the steep grade, the brakes being in very competent and responsible hands, but many mechanically appreciative individuals were curious to see how it would be in coming up—whether the speed could be regulated to the pace of the procession marching before and behind. But that gallant little motor, weighing 33,000 pounds, just worked its way up the steepest plain road in the country, slowly, carefully, with the precision of clockwork, and regulated exactly to the gait of the procession. There was no difficulty whatever about it.

Rapid Railway Building.

The Montreal *Gazette* says: The rapidity of construction on the main line of the Canadian Pacific railway in the first week in July is without parallel in this or any other country. On Saturday the rails were laid upon six miles of road, and in the week no less than 25·86 miles, exclusive of sidings, were completed, an average of about 4½ miles per day, the highest ever obtained, The record is as follows:

	Miles.
July 2	4·02
July 3	4·78
July 4	3·62
July 5	3·62
July 6	3·90
July 7	6·02
Total	25·86

The track is now completed for a distance of 728 miles west of Winnipeg, of which 161 miles have been constructed this season as follows: April 18 to 30, 17·58 miles; May 51·97 miles; June, 65·69 miles; July 1 to 7, 25 86 miles.

Prof. Marsh on the Fossil Footprints in Nevada.

Prof. O. C. Marsh, after a close examination of photographs and casts of the footprints which were found during the past summer near Carson, Nev., and which have been supposed to be those of human beings, says, in the current number of the *American Journal of Science:*

"The size of these footprints, and especially the width between the right and left series, are strong evidence that they were not made by men, as has been so generally supposed.

"A more probable explanation is that the impressions are the tracks of a large sloth, either *Mylodon* or *Morotherium*, remains of which has been found in essentially the same horizon. In support of this view, it may be said that the footprints are almost exactly what these animals would make if the hind feet covered the impressions of those in front. In size, in stride, and in width between the right and left series of impressions, the footprints agree closely with what we should expect *Mylodon* or *Morotherium* to make."

Preserving and Waterproofing Fabrics.

Piron describes in the *Moniteur Industrielle* a new process for rendering paper or cloth waterproof and at the same time protecting it from change. He employs an alcoholic solution of the agreeable oil used to perfume Russia leather, and which is obtained by distilling white birch bark.

The oil dissolves readily in alcohol, but is no longer soluble after it has once dried and became oxidized to a resin.

The thin film of resin formed by impregnating the fabric does not detract from its pliability in the least, and its aromatic odor protects it from insects. It protects quite well sea water, acids, and moderate changes of temperature.

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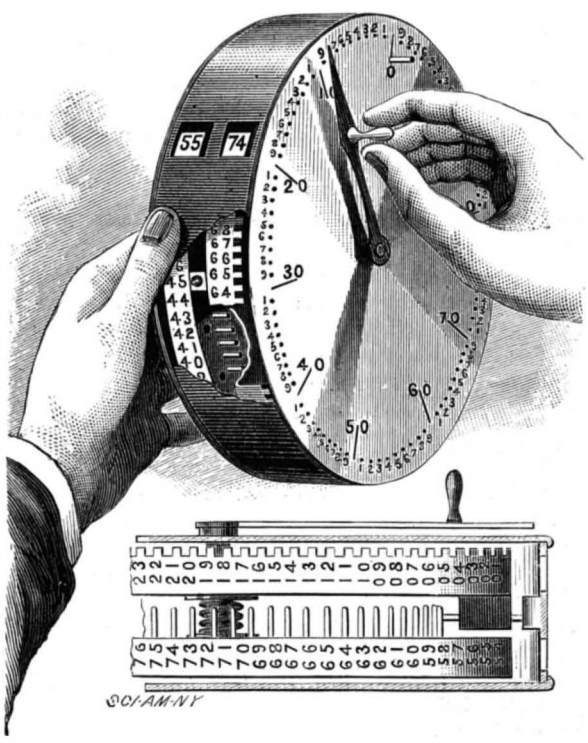
IMPROVED ADDING MACHINE.

The engraving represents an improved adding machine recently patented by Mr. Philip Neary, of McLean, N. Y. It consists of two revolving disks numbered on the edge, and in mechanism for operating the disks so that the numbers may be mechanically added. Through the center of the case extends a shaft, and on the face of the case, in a circle drawn from the shaft center, are inscribed a series of figures, from 0 to 99, inclusive, consecutively, as shown, and rigidly secured to the front end of the shaft is a hand or pointer, which is kept in its initial position at 0 against a stop by a coiled spring.



NEARY'S ADDING MACHINE.

Two circular disks mounted loosely on the shaft are peripherally numbered. The disk which registers units and tens, is provided with a flange on the inside of which are cut ratchet teeth, which register with and correspond in number to the numbers on the periphery of the disks. Into these ratchet teeth a spring pawl which is secured to the arm catches. When the pointer is turned to the right, the disk remains stationary; but when the pointer is turned to the left, the pawl engages with one of the ratchet teeth and revolves the disk with the shaft. The second disk is loosely mounted upon the shaft at a suitable distance from the first disk, and, like it, is peripherally numbered. Projecting from its inner face are a hundred tappet pins, which register with the numbers inscribed upon the periphery.

The first disk is provided with a spring tappet rod which projects from its outer face, and is so situated as to be normally out of contact with the tappet pins on the second disk.

This tappet rod moves the second disk one number each time it is brought into operation. The normal position of the machine is when the pointer is at 0 and the ciphers on the disks register with the apertures in the case. In adding a number of figures—as, for example, 20, 17, and 13—the pointer will be turned from 0 on the dial to the left until it reaches 20, and then released, and the spring, E, allowed to carry back to 0, then to the left again to 17, and so on for the next number; and owing to the pawl and ratchet teeth previously described, the disk, F, will be revolved from point to point, and the sum "50" will appear through the units and tens aperture. When the sum of the figures added equals or exceeds 100, the second disk will be also moved one point, or as many times as there are hundreds in the sum, and the amount will be read through both apertures, as will be very readily understood.

Further information in regard to this invention may be obtained by addressing the inventor as above.

Phototypes on Copper.

Copper is much better adapted to this process than zinc. It is covered with a thin film of asphalt, and when dry well washed with water, then covered with a thin film of bichromated albumen. After drying and exposing under a negative it is washed in water, colored with aniline until only the lines of the drawing remain; it is next washed with pure water, dried, and the soluble asphalt dissolved with benzine. After drying it is etched.

Menhaden Fishing.

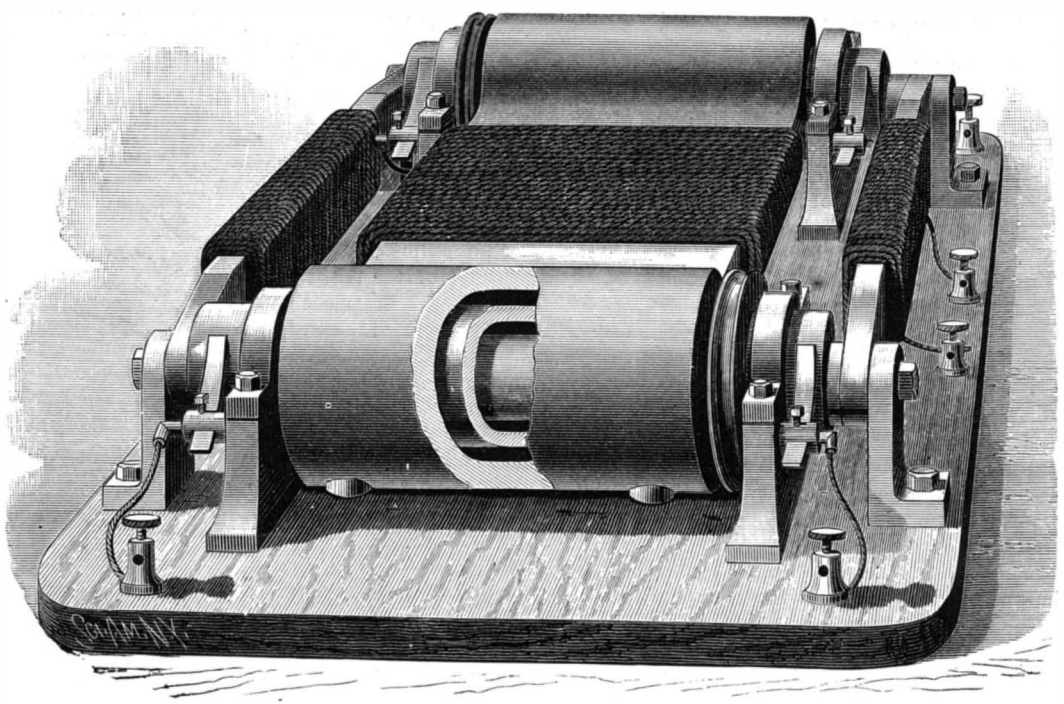
The capture of the bony fish, or menhaden, which formerly was confined to seining "along shore" by resident farmers for manuring purposes, has become an industry that involves the employment of considerable capital and the use of expensive machinery. The object of this fishery—or rather sea reaping—is primarily the production of oil, and secondarily the manufacture of an agricultural fertilizer. The fish are distilled for their oil, which is used by curriers for "filling" hides, and the solid remainder is sold as a fertilizer, for which it is well adapted. A letter in the *New Haven Palladium* says:

The life of a bony fish catcher is a hard one at best. In pleasant weather it is wearisome, and in unpleasant weather it is simply detestable. The fish have been pursued so closely in Long Island Sound that comparatively few large bunches of them can be surrounded with seines there now. Hence, the steamers have to sail miles to find them. For instance, menhaden are now being taken in the largest quantities off Barnegat, on the New Jersey coast; and consequently the Milford men have to leave here in the middle of the night and pass up the Sound, through Hell Gate, down the Narrows, and along the beach for hours before striking them. Perhaps they do not get a scale till noon. The seining, which is the hardest kind of work, is kept up till dark, and then, if the vessel is loaded, she is headed at once for Milford, reaches here late at night, is discharged, and before morning is well on her way toward the fishing grounds again. Good fishing allows no rest to the hands. They work early and late, are soaked through with water, and sleep nights in a hot and not very sweet smelling forecastle. The men earn all the money they get. Perhaps the only redeeming feature of their life is their fare. Bony fishermen are very good livers. Good cooks are employed, and the store bill of one of the steamers would run an ordinary shore hotel in fine style.

NEW DYNAMO ELECTRIC MACHINE.

The engraving represents a dynamo electric machine whose armature has neither wire nor bars, and in which no commutator is required, as the current flowing from the machine is all in one direction. This machine is remarkable for its simplicity and its economy in the use of power. It delivers a current of very low electromotive force, suitable for plating and for incandescent electric lighting. When used for the latter purpose, a small high tension machine may be employed to advantage to supply a current to the field magnets.

The machine consists of a field magnet having hollow cylindrical polar extremities, B, in each of which a tubular armature, C, revolves, the bearing of the armature being at the ends of the cylindrical poles of the field magnet. An auxiliary field magnet composed of the side bars and cylindrical pole extensions, G, extending through the armature axially completes the arrangement, and acting together with the outer magnet produces a strong magnetic field surrounding the armature on all sides. The current is conducted away from the ends of the armature by wires connecting with the armature journals, and with springs bearing on the ends of the armature. The springs are applied to insure a constant connection.



DELAFIELD'S UNIPOLAR DYNAMO-ELECTRIC MACHINE.

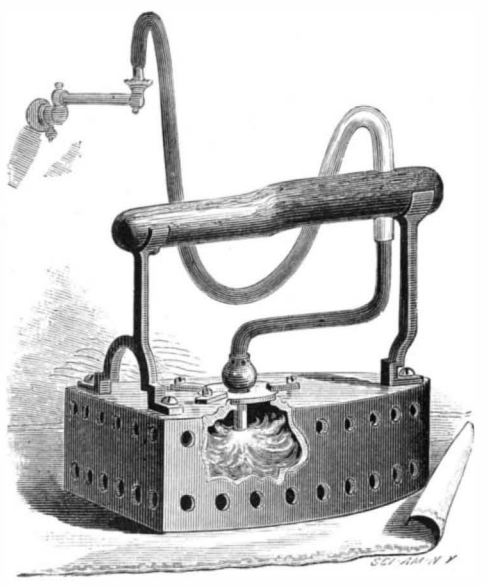
In operating the machine the current from one armature may be used to excite the field magnets, or the current from both armatures may be taken through the wire of the field magnets, or as stated above, the field magnets may be excited by a small high tension dynamo, and the entire current of the armatures may be applied to outside work.

The current from this machine is uniform and continuous, and always in the same direction, so that there are no reversals or interruptions and consequently no sparks.

This novel dynamo has been patented by Mr. A. Floyd Delafield, of Noroton, Conn.

GAS HEATED LAUNDRY IRON.

The laundry iron shown in the cut is heated continuously by gas, the heat being uniform at any required temperature. The body of the iron is hollow, and its sides are perforated with two rows of holes, and in the top is inserted an inverted Bunsen burner, the flame of which is projected on to the upper surface of the lower part of the iron. The burner receives its supply of gas through a flexible tube connected with any suitable gas supply. A rigid pipe extends from the burner through the non-conducting handle of the iron near one end. The burner is provided with a mixing chamber in which the gas and air are mixed in suitable proportions for the perfect combustion of the gas. By simply turning the cock in the gas supply pipe, the heat may be varied at pleasure.



PEDDER'S LAUNDRY IRON.

This iron has many advantages, among which are the economy of fuel, uniformity of temperature, saving of time usually consumed in changing and heating irons, avoiding the necessity of a hot fire in the house in warm weather. This invention has been patented by Mr. J. N. Pedder, Avenue Q, between 25th and 26th Streets, Galveston, Texas.

New Use for Old Oil Cans.

For striking the centers of a four span bridge over the Tamal River, in the Midnapore district, there was required for holding the sand an entirely closed receptacle, which would gradually collapse as the weight came upon it—bags, open cylindrical or rectangular boxes being unsuitable under the conditions. After considerable thought, it struck the author that empty kerosene oil tins would answer the purpose, and if so, hardly anything could be cheaper, as they only cost one anna per tin. The weight which the tins filled with sand would sustain without collapsing having been ascertained by experiment, a sufficient number were placed on the top of masonry pillars and were inclosed by masonry in mud mortar, so as to prevent their being tampered with. This was also needed as a reserve support in case of a tin bursting through faulty construction. The kerosene oil tin "sand boxes" were made to carry the centers by templates and pillar plates, as usual; and to allow of the immediate collapse on the sand being removed, the templates were made of such a size as to lie within the box. In striking the centers, the casing bricks were first removed. Coolies, armed with short and sharp pointed pegs of hard wood and ordinary hand hammers, were stationed at each box. At a given signal every man struck a hole at the side of his box, and on the pegs being simultaneously removed, and another hole made at the top of the tin, the sand ran out. The lowering, which was very easy and gradual, could be arrested at any point by allowing the sand to accumulate in front of the holes. One side could also be lowered quicker than the other by simply driving another hole into the box and increasing the flow of sand. The maximum weight supported by one of the kerosene oil tins used was, by calculation, 7·7 tons. No bulging or crushing was perceptible before the sand was run out.—*Professional Papers on Indian Engineering.*

THE Forsyth scale works have received an order for a forty-ton extension track scale for the Jacobs & Hazelton Coal Co., and a similar order from the Clark & Price Coal Co.

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THE APTERYX, OR KIWI.

The apteryx, or kiwi, is a native of New Zealand, and is a very strange, weird bird. It has scarcely a trace of wings, and is on that account called apteryx, or wingless. It has very little similarity to other short winged birds. Its body is compact, its neck short but thick, the wings so stunted that they are scarcely visible, except in the skeleton. The plumage consists of long, lancet-shaped feathers, which are covered part of their length with shiny silken down. The quill portion of the feathers is very short. The general color of the apteryx is chestnut brown. The bird has no tail. The beak is long and curved; the nostrils, very small and narrow, are set on each side of the tip. The legs are very strong and short.

Not many years ago the apteryx was thought to be a fabulous bird, and its veritable existence was denied by scientific men. The first one brought to Europe was called the Apteryx australis; it was killed in the forests of New Zealand, on the southwestern coast. A second one from the same locality was carried to the British Museum.

Almost all the specimens found in collections now come from the North Island, and belong to another species (Apteryx mantelli). This bird is called kiwi by the natives. Bartlett says that this species is distinguished from the others by being somewhat smaller; it has also longer legs and shorter claws, and there are long bristly hairs on the head. The color of the plumage is darker and more reddish.

The kiwi lives in the uninhabited forest regions of the North Island, but is wholly extinct in the inhabited regions, and is not very easily captured. Dieffenbach, who resided in New Zealand eighteen months, only obtained one skin, although he offered large rewards to the natives.

The bird is found now most frequently in Little Barrier Island, a small uninhabited island covered with dense forests, situated in Hauraki Gulf, near Auckland, and in the forests of the mountain chain between Cape Pallisir and the East Cape, on the southeastern side of the North Island. This island consists of mountains about seven hundred meters high, is only accessible in a quiet sea, and the existence of these wingless birds there proves that it was once connected with the other part of the island. Two of these birds, male and female, were captured alive near the source of the Rocky and Slate Rivers, on a dangerous height a thousand meters above the sea. The natives carried them to Hochstetter, who paid five pounds sterling for them.

In the year 1861 Skeet found the kiwi very abundant upon the grassy mountain ridges on the eastern side of the Owen River. With the help of two dogs he caught every night from fifteen to twenty of these birds. He and his people subsisted upon their flesh.

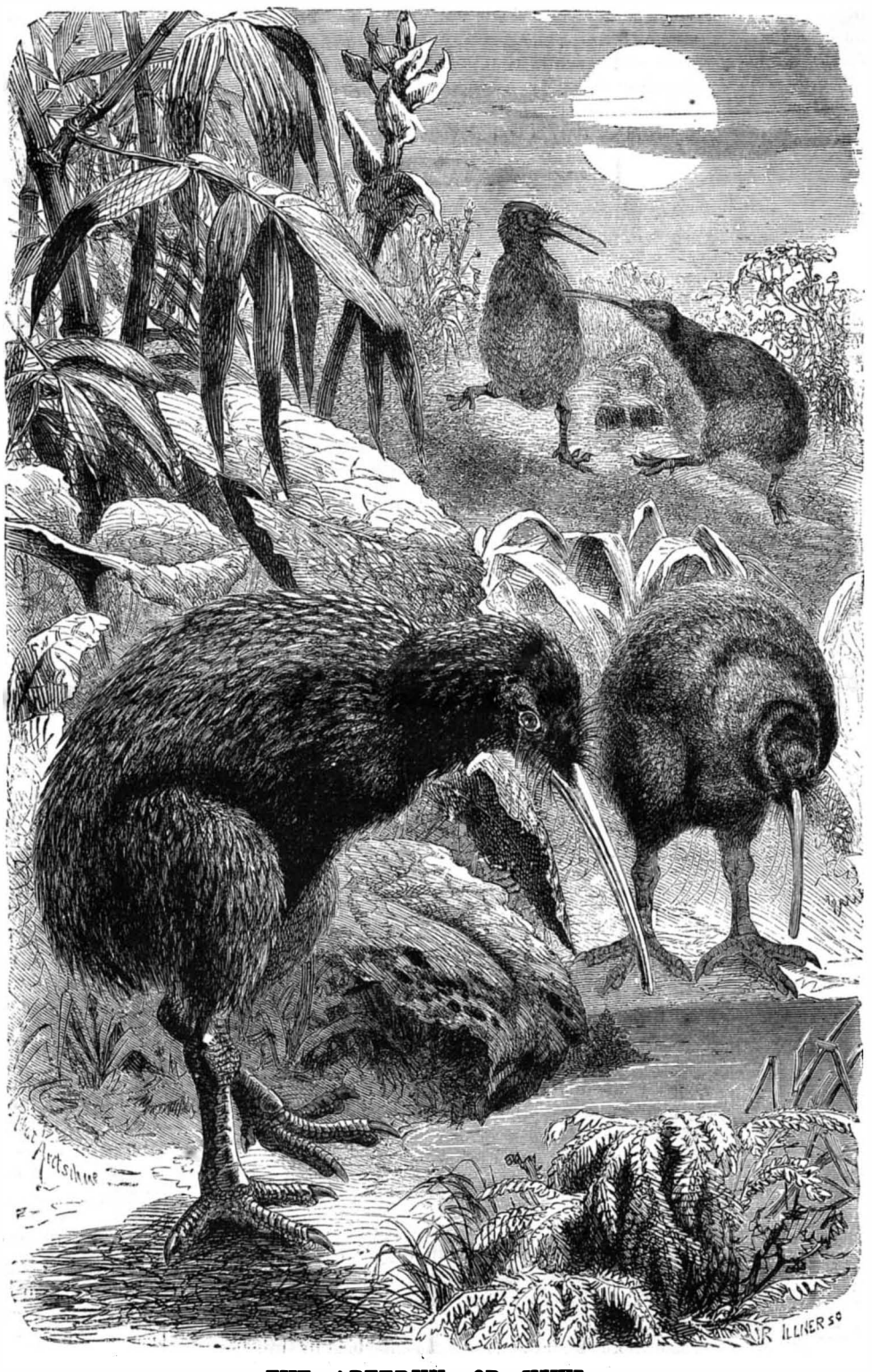
These birds are nocturnal, and during the day hide in holes in the earth or under the roots of large trees, and only come forth at night to obtain their food. They live upon insects, larvæ, worms, and the seeds of various plants. The natives hunt them only at night, and often bewilder them so with the glare of their torches that they can be caught by the hand or knocked down with sticks. They are remarkably fleet of foot, which makes up for the absence of wings. When running they take long strides, hold their body in an inclined position with the neck stretched out. They move cautiously, and as noiselessly as a rat. If disturbed during the day they yawn frequently, and wrench their wide open jaws out of shape in the most singular manner. If provoked they raise their body to an erect position, lift up the foot to the breast, and strike with it, their only but not insignificant weapon of defense. It has been said that they attract worms to the surface by striking on the ground with their powerful feet.

While in search of food they make a constant snuffling sound through the nostrils. It is doubtful whether they are guided by the sense of feeling or of smell. It is certain that the sense of feeling is strongly developed, for they touch every object with the point of their bill, whether they are eating or examining the ground. When they are confined in a room or cage, the snuffling sound is only perceptible during the night when they are in search of food or eating, and is not heard when they softly touch the walls of the cage. Buller has observed these imprisoned birds searching the ground in the immediate vicinity of a lost worm, without finding the morsel again, and has noticed that they are never able to take a piece of meat from the ground or from a vessel of water until they have touched it with the point of their bill.

It is very amusing to see the free birds searching for worms. They thrust their long bill in the soft ground, sinking it almost to the roots, and draw it forth immediately with a worm in the point of the bill. They never draw the worm from the ground suddenly, but are very careful not to mangle it. When they have laid the worm on the ground, they throw it into their jaws with a sudden motion, and then swallow it. They consume insects and berries in the same way, and take up small stones.

In the London Zoological Gardens the cage of this bird is in a dark stall; some straw is piled up in one corner. The Kiwi conceals itself behind this straw during the day. If the keeper takes it out from its hiding place it looks puzzled for a time, but when it is placed on the ground it turns its back and runs back to the straw in the most absurd style. After the sun goes down it runs about in a lively manner, and thrusts its long bill into every corner.

The female in the London gardens has laid several eggs. The bird weighs a little more than four pounds, and the eggs, which are remarkably large, weigh between fourteen and fifteen ounces.



THE APTERYX, OR KIWI.

"The skin of these birds is very tough, yet flexible, and the chiefs in New Zealand set great value upon it for the manufacture of their state mantles, permitting no inferior person to wear them, and being extremely unwilling to part with them even for a valuable consideration."—*From Brehm's Animal Life.*

Peanut Flour.

The value of the peanut crop of this country for the current year is estimated by the Savannah *Telegram* at $3,000,000. That paper says that "the Virginians are beginning to turn the peanut into flour, and say it makes a peculiarly palatable 'biscuit.' In Georgia there is a custom, now growing old, of grinding or pounding the shelled peanuts and turning them into pastry, which has some resemblance, both in looks and taste, to that made of cocoanut, but the peanut pastry is more oily and richer, and, we think, healthier and better every way."

Lime Cartridges for Mining Coal.

According to the *American Manufacturer* (Pittsburg, Pa.), some experiments have been made with cartridges of condensed lime in mining coal at the Eureka mine at Houtzdale. The tests were successful in shattering the coal, but better results would have been reached if the coal had not been too soft. It appears that the lime charges must be compressed by hydraulic or similar means under a pressure of forty tons on a cylinder of two and a half inches, nearly doubling the density of the lime. Thus treated, and secured in a hole drilled in the coal, water is pumped to the cartridge, reaching its entire length, and the expansion effects an enlargement of five times the original bulk of the cartridge, necessarily shattering the surrounding walls of coal to that extent without an explosion.

Removing a Bluff by Hydraulic Power.

The Sioux City *Journal*, describing a test of hydraulic machinery to be used in washing away the threatening bluffs which hang over the track of the Milwaukee road two miles west of that place, says: From the Worthington pump, which is considered the more powerful of the two on the boat, an 8-inch pipe extends up the bank to a height of about 60 feet, where it reaches the road bed of the track. It then runs under the track nearly to the base of the bluff and terminates in a movable iron nozzle with a 2-inch end. From the point where the nozzle is directed toward the bluff begins a sluiceway constructed of boards and about 2 feet deep. This sluiceway leads under the track, downward in a diagonal course to the river.

The pipe through which the water rushes to the nozzle is well secured. The sluiceway is constructed on timbers, and is strongly braced. As the nozzle points toward the bluff, without the water rushing from its mouth and the sluiceway is dry, there is nothing particularly curious or interesting in the machinery's appearance; but when the big boiler at the water below begins to puff, the powerful pump commences action, and the glittering stream shoots from the mouth of the nozzle with lightning speed, and, hardly spraying, strikes the bluff with terrific force, boring deep into the earth and causing the dust to rise in clouds, some appreciation of the force of the water can be gained. Then too, the practical result of the aqueous battering ram's power is seen in the mass of mud which rushes through the sluice.

Hundreds of tons of earth made soluble melt away in an hour and are swiftly carried off through the apparently small board runway to the river below. When all was ready the signal was given, and the water began to rush through the pipe and pound away at the bank. In five minutes immense quantities of the dirt were melting and rushing through the sluice. The cutting was done in a scientific manner. First, the water was sent against the bluff sixty feet up, and holes bored to weaken its dry solidity. Then the boring began underneath, and the foundation of a mass of earth sixty feet high and ten feet thick by about fifty feet in width was dug away. All at once the big chunk gave way, and with vast clouds of dust and much noise fell downward and toward the track. The plucky pipe man and his assistants were the least disturbed by the slide and advance of the earth, but they had cause for alarm, as for an instant it looked as if a large portion of the bluff would be affected by that detached, and would break loose to sweep everything before it to the river.

During the hour, while the crowd of visitors remained, a much larger quantity of earth was washed away than was expected when the work commenced, and the officials generally seemed to be satisfied that at last an effective way of conquering the dangerous bluff had been found. It being understood that General Superintendent J. T. Clark was the proposer of the hydraulic method of cutting away the bluff, and that principally through his efforts it has been brought to a practical test, he was briefly interviewed. He expressed himself much pleased with the result of the experiment as far as it had gone. He added that it was only an experiment, but that it looked to him as being much more effective than blasting or shoveling, while the ultimate expense would not be half so great.

THE Ohio Powder Company is making 250 kegs of powder per day, and running the machinery day and night to keep up with its orders.

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The Phenomena of Metalliferous Deposits.

BY PROF. JOSEPH LE CONTE.

The following is an abstract of a paper read before the American Academy of Sciences at its late meeting in Washington, which in the author's absence was read by Prof. T. Sterry Hunt:

The paper said that the phenomena of metalliferous deposit by solfatusic action at Sulphur Bank and Steamboat Springs have tended strongly to confirm what he had previously believed to be the most probable theory of vein formation, and at the same time to give it more clearness and definiteness. The structure, the mode of occurrence, and the contents of metalliferous veins leave no longer any room for doubt that they have been formed by deposit from solutions. If any doubt had lingered on this subject, it was thoroughly dissipated by the phenomena of deposit still in progress at Sulphur Bank and at Steamboat Springs. Among the metallic ores cinnabar has long been considered a possible exception to this mode of deposit. The extreme volatility of this sulphide, the extreme irregularity of its veins, and its frequent occurrence in the vicinity of comparatively recent volcanic action have suggested that it may have been deposited in irregular fissures, cracks, cavities, etc., by condensation of its vapors sublimed by volcanic heat beneath. But the phenomena of Sulphur Bank and Steamboat Springs ought to settle the question forever. Cinnabar as well as other metallic sulphides are now being deposited there, along with silica, from solution. Admitting, then, as established the view that metalliferous veins have been deposited from solutions, the most difficult questions still remain: What are the conditions under which deposit takes place? and, What, in addition to simple water, have been the solvents?

In answering the first question it must be remembered that the chemistry of nature is far more subtle and refined than that of the laboratory; that substances which are regarded as practically insoluble in the latter cannot be so regarded in the former. The infinite patience of nature and the infinite slowness of her operations must be taken into account. In the perpetual circulation of subterranean waters infinitesimal deposits, continued and accumulated through almost infinite time, produce large results. Thus mineral veins may be composed of substances of extremest insolubility, and yet be deposited from solutions. In fact, such extreme insolubility, or at least very feeble solubility, would seem to be a condition of mineral vein formation, for otherwise the minerals would be in most cases brought to the surface instead of being deposited below.

Again, it must be borne in mind that solubility, even the feeblest, is notably increased by heat, especially super-heat, and by pressure. The latter is generally regarded only as a necessary condition of super-heat and not as itself an active agent. But in fact pressure acts directly as an active agent in increasing the solubility of nearly all substances. Mr. Sorby has not only proved this by actual experiment on a great variety of substances, but has shown that it is a necessary consequence and beautiful illustration of the law of correlation and conservation of natural forces, and that we have in this as in the case of fusibility an example of the equivalency of mechanism and molecular forces. For, as in the matter of fusibility in all cases in which expansion takes place in fusion, pressure by resisting expansion raises the fusing point, while only in those exceptional cases like ice, in which contraction takes place in fusion, pressure by arresting contraction lowers the fusing point. So also in the matter of solubility, in all cases in which contraction takes place in solution, namely, in which the volume of the solution is less than the combined volumes of constituents, pressure by arresting contraction increases solubility, while only in very exceptional cases as, for example, sal ammoniac, in which expansion takes place in solution, pressure by resisting expansion diminishes solubility. These latter cases are so extremely rare that we may assume as a law the increased solvent power of water in proportion to pressure. It is even possible by experiment thus to determine the mechanical equivalent of the chemical force of solution of any given substance; and, in fact, this has been so determined for several substances by Mr. Sorby.

There can be no doubt, then, that the solvent power of water may be increased without limit by corresponding increase of heat and pressure. It is quite certain, therefore, that water deep in the interior of the earth, especially in volcanic regions, and therefore under heavy pressure and superheat, would have its solvent power greatly increased, not only by the super-heat, but also by the pressure. It is believed that few substances could resist entirely its solvent power. Such waters, coming up slowly toward the surface through fissures, large and small, would have their solvent power diminished both by cooling and by relief of pressure, and must of necessity deposit in their courses and form mineral veins. But the solvent power of subterranean waters is still further very greatly increased for most vein matters by the pressure of alkali in the form of alkaline carbonates or alkaline sulphides, or both. This is especially true of the commonest of vein stuffs, viz., quartz and lime carbonate, and the commonest forms of metallic ore, viz., metallic sulphides. The solubility of silica in alkaline carbonated waters is well known, and with excess of carbonic acid in the waters all the earthy and metallic carbonates are also soluble. The solubility of many and probably of all metallic sulphides in alkaline sulphides, especially with excess of hydrogen sulphide under pressure and super-heat, can no longer be doubted; for iron sulphide and mercuric sulphide are now being deposited from such waters, both at Sulphur Bank and at Steamboat Springs.

Mr. Christy and others have proved the solubility of mercuric sulphide under pressure and super-heat by actual experiment; and these are among the most insoluble of metallic sulphides. It is certain, then, that metallic sulphides are soluble to a limited extent in alkaline sulphides, forming doubtless double sulphides. It is certain, also, that the solubility is increased by super-heat and pressure. It is therefore also certain that hot waters containing alkaline carbonates and alkaline sulphides, circulating at great depth and therefore under heavy pressure, would take up silica, earthy and metallic carbonates, and metallic sulphides, and that coming up slowly toward the surface they would deposit these substances in their courses, partly by cooling and partly by relief of pressure, and thus form metalliferous veins. Cooling and relief of pressure are the most useful causes of deposit, but not the only ones. Organic matters are of almost universal occurrence in subterranean waters, and their agency in reducing metallic oxides and metallic salts is well known. Organic matter is a universal reducing agent.

The acids of organic decomposition may prove a reducing agent. Such in brief is an outline of a true theory of the genesis of metalliferous veins—a theory apparently confirmed by the study of causes now in operation at Sulphur Bank and Steamboat Springs, and probably many other places in California and Nevada.

Sea Bathing.

At the present time, says the *British Medical Journal*, it may be useful to recall the chief general indications and contra-indications which respectively sanction and forbid bathing in the sea. "Shall I bathe?" This is a question which thousands of health seekers will be asking of their doctors during the next few weeks. While the stimulus of a fresher air, of change of scene, and of new occupations, together with rest from accustomed work, are the elements from which the weakly, the worn, the worried reap physical and mental restoration in a sojourn on the sea coast, it is unquestionable that bathing in the open sea is, in itself, a powerful restorative agency, which many persons may employ with very great advantage.

The universal experience of our race, through unnumbered ages, has shown the value of sea bathing in both preventive and curative medicine. A good rule, laid down by an experienced physician, is this: In all cases showing impaired functional powers, without any manifestation of inflammatory symptoms, in short, in those cases in which the exhibition of alteratives and tonics is indicated, sea bathing may, with proper precautions, be resorted to: it is contra-indicated in persons of plethoric habit of body, in cerebral congestion, in organic disease of the heart, in aneurism, and in all persons who have the inability safely to encounter a comparatively severe shock; while it is also to be forbidden at certain periods in which the female constitution is not prepared for the application of powerful remedies. Because it tends, in certain conditions of impaired health, to cause determination of blood to the viscera. Bathing in the open sea is generally unsuitable for persons disposed to congestive disorders of the lungs, kidneys, liver, and brain. Albuminuria, advanced anæmia, and a liability to hæmoptysis are also conditions which are usually accepted as contra-indicating sea bathing.

It is hurtful to bathe babies in the sea; children under two years of age are too young to bear with advantage the comparatively severe shock of a cold sea bath. In old age, when the bodily powers are unequal to a vigorous reaction, sea bathing may do much harm, especially in the subjects of extreme arterial degeneration. In suitable cases, and under proper precautions as to time of bathing and duration of exposure, a daily bath in the open sea is a valuable restorative. In individuals who are fairly robust, it is a stimulant, alterative, and tonic, promoting appetite, tissue change, and excretions, and bracing up the nervous, vascular, and muscular systems. Sea bathing is especially useful as a powerful and unsurpassed tonic in delayed convalescence from acute diseases, in many chronic affections, and in persons whose strength has become enfeebled by injurious excesses, by mental strain, or by unhealthy occupations.

The Aeration of Yeast.

Some interesting experiments on fermentation have been made by D. Cochin, and his results are given in a recent number of the *Comptes Rendus* of the French Academy of Sciences. Other investigators have proved that the membrane surrounding yeast cells is penetrated by glucose solution, and fermentation does not commence until some time after this endosmose has taken place, and this has been fully confirmed by Cochin. His experiments on aeration of yeast are most interesting, and the conclusions founded on them are in some respects striking. He found that if yeast be suspended in water and aerated by repeatedly decanting the liquid from one vessel to another, the aerated yeast, when added to a solution of glucose, exerts simply a diluting effect equal to that which would be produced by the same volume of water; if, however, the yeast be deprived of air by suspending it in recently-boiled water, and covering the water with a somewhat thick layer of oil, and heating the liquid to 20° C. for periods varying from two hours to several days, the effect produced on a solution of glucose is different. After eight days' heating the yeast is still permeable to the sugar solution, but fermentation scarcely commences; the yeast has been asphyxiated. After two hours' heating, the absorption of sugar begins, but it is only after twenty-four hours' heating that the phenomena are most distinctly observed; at the end of this period, when the yeast, thus deprived of air, is added to a solution of glucose, the latter is absorbed by the yeast cells to such an extent before fermentation commences that the amount in solution is diminished one-half.

If a quantity of the liquid is boiled, mixed with an equal volume of alcohol, and filtered, almost the whole of the sugar is found in the filtrate, only a small proportion having been converted into alcohol, thus proving that very slight fermentation takes place under these conditions. From these experiments it is evident that the transformation of sugar takes place in the interior of the cells, and that deprivation of air brings the cells into the condition most favorable for absorbing the sugar. Cochin also observed that aerated yeast and yeast deprived of air, also show great difference in their fermentative power. The former produces an amount of alcohol much below the normal amount, and decomposes part of the sugar without converting it into alcohol. The practical lesson to be learnt from these investigations is, that a wort prior to pitching, and the pitching yeast itself, ought always to be deprived of air as much as possible, but as soon as the sugar has had time to penetrate the membranes of the yeast cells by endosmose, a thorough aeration of the wort ought to be effected, so as to set up and maintain an active fermentation.

The Power of Water.

The properties of water are only partially understood by those who have never seen it under high pressure. The Virginia City Water Company get their supply from Marlette Lake on the Tahoe side of the mountain. They get it through by a long tunnel, and are then on the crest of a high mountain opposite Mount Davidson, with Washoe Valley between. To cross this valley by a flume would be almost impossible, so the water is carried down the mountain side to the bottom, and crosses under the V. & T. Railroad track, on the divide between Washoe and Eagle valleys, then up again to the required height in iron pipes. The depression created in the line of carriage is 1,720 feet, and the pressure on the pipes is 800 pounds to the square inch. One pipe is 11 inches in diameter, and is quarter-inch iron lap welded, and 18 feet long, with screw joints. There is little trouble from it, but the other, which is twelve inches in diameter, and is riveted pipe, makes more or less trouble all the time. The pipe is laid with the seam down, and whenever a crack is made by the frost or sun warping it, or from any other cause, the stream pours forth with tremendous force. If the joint is broken open, of course the whole stream is loose and goes tearing down the mountain, but usually the escape is very small. The break last week was less than five-eighths of an inch in diameter, and yet the water in the flume was lowered an inch and a half by it, and the pressure went down fifteen or twenty pounds. Captain Overton says that fifty inches of water went through it. It has been probably a year in cutting out, and was made by a little stream hardly visible to the naked eye, that escaped through a joint and struck the pipe two or three feet off, eating away the iron until the pressure inside broke it through. When such a break occurs the noise can be heard for half a mile, and the earth shakes for hundreds of feet around. A break the size of a knitting needle will cut a hole in the pipe in half an hour. Such breaks are repaired by putting a band around the pipe, pouring in melted lead, and tamping it in. Such a stream bores through rock like a sand blast. The flying water is as hard as iron, and feels rough like a file to the touch. It is impossible to turn it with the hand, as it tears the flesh off the bones, and if the fingers are stuck into the stream, with the point up, the nails are instantly turned back, and sometimes torn loose from the flesh.—*Reno Gazette.*

Sewer Gas and Typhoid Fever.

Dr. George Hamilton, in the *Medical Record*, takes issue with those who assume the conveyance of germs of typhoid and scarlet fevers, diphtheria, and dysentery by contaminated drinking water, and who do not believe that sewer gas can spread the infection or originate the diseases. Referring to the epidemics that sometimes occur suddenly in cities fed with drinking water from some common source, he says that their sudden appearance and as sudden disappearance cannot be attributed to the character of the water, except on the supposition that the water changes suddenly from purity to impurity, and *vice versa*, a supposition incompatible with the delivery supply of water from reservoirs. Walled-up cesspools, he says, are common in the city and not usually found in the country, and the exhalations from unventilated and uncared for vaults have much to do with the prevalence of typhoid diseases.

An Aid to Russian Literature.

From Nicolas Schischkoff, a member of the Imperial Russian Technological Society, St. Petersburg, Russia, we have received a copy of a monthly publication in the Russian language that attempts to give its readers "a guide through the mazes of contemporary technical literature," by copious extracts from technical publications from all parts of the world, and by an alphabetical reference index. Such a monthly is well calculated to be of use to Russians who desire an acquaintance with the sciences as practically applied by the western nations of Europe.

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Effect of Condiments, such as Salt and Pepper.

The following contribution to the *Bulletin* of the French Hygienic Society by Dr. G. Husson has been deemed worthy of translation, from its practical bearing on our daily life:

When we cast a retrospective glance at the culinary art among all people, extending back to the most remote antiquity, we are surprised at the importance that seasoning and condiments have never ceased to have.

This peculiarity possesses sufficient interest to induce us, at another time, to study into the origin, causes, and effects of their use. At present we will merely examine into their influence on digestion, and will report on salt and vinegar alone.

Condiments, in fact, are not only intended to make the food more agreeable, to excite the appetite, to flatter the palate, and to create enjoyment, but they also have an effect on the phenomenon of digestion. Science has recognized the fact, and man has always instinctively felt this influence of condiments upon the digestive functions; but then he frequently only thinks about satisfying his taste. It is the necessity of his being that he obeys. The care bestowed on the preparation of food has existed everywhere and at all times, originated in these impulses, and they are next to medicine and chemistry in calling attention to the necessity of giving attention to the preparation and seasoning of food, even of the simplest kind. Still we would not insist on this subject if it were not for combating an unfortunately very common custom.

It too frequently happens that because a dish is modest the preparation is neglected, and people think to supply what is lacking by heavy doses of salt and pepper. Here two serious errors are committed, for it is with our food as with our dwellings: the more simple they are, the more care they should receive.

The use of salt and of acids in excess may prove injurious, as we shall attempt to prove by certain experiments that we have made. These experiments were made on pieces of meat deprived of fat and gristle, either dressed with all sorts of condiments, with wine, with vinegar, with oil, or simple dishes with some salt but no liquid.

After the pieces of meat had been macerated or in contact with the condiments for four days, four grammes were taken from each sample and put in a phial with one gramme of liquid pepsine and 40 grammes of water containing 0·1 per cent of hydrochloric acid.

For comparison two other phials were taken, and in one was placed 4 grammes of meat that had not been subjected to any culinary preparation, with a gramme of pepsine and 40 grammes of acidulated water as before. In the other phial were placed the same substances and in the same quantities, except that the acid was 1 to 40. They were all put in a water bath and kept at a temperature of 40° C. (104° Fahr.).

The results were as follows:

The meat in wine was very rapidly digested, and that in vinegar followed next. The meat in oil and that *au charbon* fell in the third line; they required nearly as long a time for digestion as the meat that had had no culinary preparation; salt meat and raw meat that had been in the stronger acid were very difficult of digestion.

With papaine, a substitute for pepsine, the results were still neater, but were in harmony with the preceding.

These experiments also showed me at the same time how little reliance can be put on commercial pepsine.

Other experiments lead to certain remarkable conclusions regarding salt and acetic acid, as follows:

If four grammes of hashed meat be placed in a phial with four grammes of water, one of liquid pepsine or papaine, and four drops of hydrochloric acid, and the following quantity of salt added, namely, 0·05, 0·1, 0·25, 0·5, 1, 2·5, and 5 grammes, it will be found that salt in small doses slightly facilitates the action of peptic ferment; but when it reaches 0·5 gramme it retards digestion; and in proportion to the quantity present.

When glacial acetic acid was used instead of salt, in quantities of 4, 2, 1, 0·5, 0·25, and 0·10 gramme, the meat dissolved more rapidly the greater the quantity of acid there was. With papaine and four grammes of acetic acid the transformation was almost instantaneous. But although an excess of acetic acid dissolves the meat more rapidly, it is necessary to add that besides the peptones, there is also a substance formed from gelatine which is precipitated by sulphate of magnesia, and the quantity is directly proportional to the amount of acid.

If we take one gramme of monohydrated acetic acid and one of meat, and filter it after digesting and neutralizing, a precipitate will be produced with sulphate of magnesia, but it is scarcely perceptible. So that we may accept from 1 to 1½ per cent of acid, or from 10 to 15 per cent of vinegar, as the proportions favorable to good and rapid digestion.

From the preceding facts we may draw the following practical conclusions:

A. Certain condiments seem to have no other use beyond exciting the secretion of the various juices necessary for digestion.

From one point of view salt, in small quantities, may be placed in this class, if when it enters the system it is not transformed into hydrochloric acid, one of the constituents of the gastric juice. The amount of salt employed in cooking ought not to exceed 1 or 2 per cent or 1 ounce to 6 or 12 lb. of meat. If more than that is employed, it will do one of two things: 1. It will modify the structure of a portion of the muscular fiber of the meat salted, so as to make it resist more strongly the action of gastric juice; 2. In the stomach itself it retards and checks peptic fermentation.

Hence, salted and smoked meats are more indigestible than other meat.

Salt in excess is also an irritant.

B. Non-poisonous organic acids aid digestion. Hence the use of vinegar as a condiment is based on good reasons, but with the condition that the quantity must not be so great as to irritate the stomach itself.

C. Although the mineral acids, hydrochloric in particular, in the proportion of 1 to 250, are essential for digestion, in large quantity they have the opposite effect, and may even arrest it.

This inconvenience and the danger of setting up an inflammation in the mucous membranes show the necessity of employing vinegar entirely free from hydrochloric or sulphuric acid.

Such is the *resume* of my observations relative to this part of the question.

G. HUSSON.

Device for Discharging Water from Vessels.

Last week a successful practical trial was made in this harbor of Keating's improved device for discharging water from ships without pumping. The invention consists of a valved tube which passes through the hull of the vessel, at or about midships. The tube is arranged to be pushed down outside of the hull when in use, and withdrawn even with hull when not in use. The tube carries a valve, by opening which communication between the inside of the hull and the water outside may be established. The extremity of the tube, looking toward the stern of the vessel, has an orifice, but the front portion of the tube is solid. When the tube is pushed down through the ship's bottom, the forward motion of the vessel will produce a suction in the tube, and if the valve is opened the water in the hull will be drawn out.

The inventor expects that sailing and steam vessels may be kept dry and prevented from sinking by simply adjusting the tube and valve as above indicated. On the recent trial here the valve was applied to an old scow sixty feet long,, towed by a tug. The valve was opened and water was allowed to flow in and fill the scow until it was almost ready to sink; the tug was then started, and under a speed of three miles an hour the scow was in ten minutes relieved of its water in the manner described. A similar trial was lately made at Buffalo, N. Y., with equal success. The invention has realized in practice all that the inventor claims, as far as it has been tried. How it will work on deep draught vessels, where the water pressure against the bottom of the hull is increased, has yet to be shown. The Keating Company, No. 86 Duane Street, New York, is now ready to furnish and attach this novel appliance to vessels of all descriptions.

Steaming and Bending Wood.

In an address recently delivered by Mr. H. G. Shepard, of New Haven, Conn., relative to the use of wood in carriage making, he said that after a piece of wood is bent its characteristics undergo a considerable change. The wood is heavier, and its fibers have become interlaced; it will sustain more pressure and strain than straight wood in the same directions, either across or with the grain. He said: A piece of timber that has been steamed, whether it is bent or not, has its stiffness increased. It is more brittle than it was before, and for some uses it will do as well, and yet there is a quality that the steaming process and the kiln drying process affect very much the same; they both cook the gum in the timber and make it brittle and stiff. There is a grade or class of hickory that is benefited by being steamed or kiln dried for use as spokes or whiffletrees. There is a kind of hickory that never becomes stiff by a natural process of drying, and one of the desirable qualities of a spoke, rim, or whiffletree, is stiffness as well as strength: you take that hickory—and it is the very best we have—and steam it, and it is better fitted for these purposes than it was before. It is difficult to tear apart a piece of bent wood; the fibers are interwoven, one with the other. We do not perceive the change on the outside, but when we come to split the stick open we find that its character is entirely changed.

A Singular Tombstone.

Doctor Prime, the venerable editor of the New York *Observer*, usually spends the summer months traveling in his native State, and about New England, and wherever he stops he is a welcome visitor. His weekly letters in the *Observer* are widely read, and are enjoyed by everybody.

In his travels, Irenæus comes across some quaint people, and many queer things which he keenly appreciates, and he gives an account of them in his interesting letters.

Among his last discoveries, Dr. Prime has found an odd monument in northern New York, which had been erected to the memory of a most excellent woman. A good man had lived happily with a devoted wife until they were well on in years, when she died. He bethought him of some fitting memorial to place over her grave, and the happy thought struck him that the square stove, by which they had been comfortable through many long winters, would be just what she would like to have if she had a voice in the matter. He had the stove taken to the churchyard and placed over the remains of his companion, who sleeps quietly underneath it.

Brooklyn Bridge Traction Cable.

Splicing the endless cable that is to be used in propelling cars over the New York and Brooklyn Suspension Bridge was a work requiring unusual skill, as it was an unusual task. The rope is a compound of a hemp core or center and an envelope of steel wire. It is 11,600 feet long, or about two miles. Its weight is 3·1 pounds per foot, which gives it 35,900 pounds for a total weight. The diameter is 1½ inches, and it has a breaking strength of 50 net tons. The splice is 160 feet long. It would be useless to our readers to attempt a description of the method of splicing, which, however, is similar to that of hemp or Manila rope splicing so far as that is applicable to this composition cable. The skill particularly required in this work is the union of the steel wire envelope. And this work is so exactly completed that to designate the splice from the other portions of the cable it has been painted white. It is probably the longest rope splice ever made.

Rights of the Bull in England.

A recent decision by Lord Coleridge, C.J., in the Queen's Bench Division, as quoted by the *New Jersey Law Journal*, sounds singular here, where statutes and municipal regulations so generally prohibit estrays, and hold their owners liable. Unfenced highways are increasing under the protection of these laws, and in some New England cities and villages there are long stretches of front yards and lawns without any defensive protection from the traveled street or roadway. The judge in this case ruled that the owner of an ox, which had entered the plaintiff's open shop door while being driven through the street, could not be held liable for damage done. He said: "We find it established as an exception upon the general law of trespass, that where cattle trespass upon unfenced land immediately adjoining a highway, the owner of the land must bear the loss (quoting authorities). I could not, therefore, if I would, question the law laid down by such eminent authorities, but I quite concur in their views, and I see no distinction for this purpose between a field in the country and a street in a market town. The accident to the plaintiff was one of the necessary and inevitable risks which arise from driving cattle in the streets in or out of town."

The Curl Fungus on Peach Trees.

The New York Agricultural Experiment Station gives this, among other items, in its bulletin of July 28:

Dr. B. D. Halsted, of New York city, who is especially skilled in that branch of science which includes the injurious fungi, has forwarded us a letter from which we quote:

"May I add to the information on *the peach curl* given in the bulletin for June 16? This injurious deformity of the peach leaves has been ascribed to plant lice and other insects, but is now known to be caused by a minute fungus known to science as *Taphrina deformans*. This minute parasitic plant makes its appearance in early spring, and causes the foliage, as stated in your bulletin, to twist and curl out of natural shape. The fungus is not distantly related to or causing the black knot of the plum and cherry trees, and the same remedy is the only one used, as far as I know. Remove all the affected parts so soon as they appear, and burn them. It is best to cut off the young twigs bearing the 'curled' leaves, and this can be done quite rapidly. Be sure and burn all parts removed, to prevent the ripening of spores in the infested leaves."

Maple Last Blocks.

The Bangor, Me., *Mining and Industrial Journal* has the following: Last blocks are an important article of manufacture in the towns of eastern and northern Maine. Blanchard, Lagrange, Alton, and Katahdin Iron Works will each ship about 25 car loads this season over the Bangor and Piscataquis Railroad. Large numbers are also cut on the line of the Eastern & North American division of the Maine Central, and also in the towns to the eastward of Bangor. The blocks are cut from rock maple, and the work of getting them out gives quite remunerative employment to the farmers and their sons during the long winter months. A million and a half of these blocks, valued at about $36,000, were shipped from Bangor last year, principally to western Maine, New Hampshire, and Massachusetts shoe towns. This, however, by no means includes all the last block business of this section, as large quantities are shipped each season by way of Calais.

Products of the Slow Combustion of Ether.

When the vapors of ether mixed with air pass over a strip of glowing platinum, it continues to glow and the slow oxidation produces a mixture of formic and acetic acids with aldehyde, acetal, and methyl aldehyde. Legler has investigated this product (*Ann. Chem.*), and succeeded in isolating another new substance. From the slow oxidation of 150 or of 200 c. c. ether he obtained 25 or 30 c. c. (1 ounce) of a clear liquid with a sour smell resembling aldehyde. Upon cooling this in a desiccator the new substance crystallized out rhombic prisms.

It contains 26·44 per cent of carbon to 6·42 of hydrogen which points to the empirical formula $C_{11}H_{33}O_{21}$. It is a peculiar fact worthy of note, that when treated with ammonia and then acidified it exhibits the same reaction exactly as peroxide of hydrogen. Legler is engaged in investigating the constitution of this new substance.

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ENGINEERING INVENTIONS.

Mr. O. H. Robinson, of Manistee, Mich., is the patentee of an improved rotary engine, in which he employs a wheel or case having internal steamways eccentric to its shaft, and provides the shafts with a radially moving valve which serves as a gate or piston against which the steam acts.

Mr. A. O. Willson, of Madison, Ga., has recently patented a traction or road engine, which provides for the application of increased power on ascending grades, and provision is also made for the convenient and ready turning of the engine in either direction. Increased power can be applied to both wheels at once or to either wheel, as desired. This engine is constructed very cheaply, and possesses useful features not found in other traction engines.

Mr. William Wilmington, of Toledo, O., has obtained a patent for a method of casting car wheels, which is an improvement upon a patent granted to same inventor March 6, 1883. This method of casting car wheels consists of nearly or quite filling the mould of the wheels with suitable chill hardening cast iron, then placing in the receiving basin of the mould finely powdered ferro manganese or its equivalent, and allowing the same to be melted by the molten iron remaining in the basin, and then agitating the iron remaining in the basin and keeping the inlet holes open by churning.

MECHANICAL INVENTIONS.

A patent has recently been issued to Messrs. F. F. and H. F. Hartwich, of Onaga, Kas., for an improved boring machine. The invention consists of an improved feeding mechanism, and a system of change-gearing for driving the same, whereby the feed gear can be reversed to withdraw the auger to bring the chips from the hole, while the tool continues to revolve in the same direction as when boring.

An improved dredging machine has been patented by Messrs. Larence A. Johnson and Nels E. Johnsen, of Portland, Oregon, which consists of one or more spurred cylinders for breaking and loosening the bed of shallow rivers or streams, and with a propeller screw for agitating the water, and causing the loosened sand, mud, etc., to be carried off by the current. The machine is very simple in its construction, and not likely to get out of order by use.

A very simple portable hay press to be worked by hand power has been patented by Mr. Geo. W. Freeman, of Gadsden, Ala. The follower in this machine consists in a plunger with long projecting arms to the extremities of which are attached ropes which pass over a roller that is rotated by a hand lever. A pawl and ratchet wheel is attached to the roller for taking up the slack, and holding the follower up to its work.

Among the recent improvements in fire escapes is to be found the extension ladder patented by Mr. Joseph Spangler, of Rock Island, Ill. The invention consists in contrivances for raising and lowering, and for locking and unlocking the ladder. A seat is arranged on the upper end of the top section to enable the ladder to be used as an elevator to facilitate the rescue of persons unable to descend by the ladder. The ladder is also adapted for the use of painters, builders, and others.

An improved rotary shingle planing machine has recently been patented by Mr. Samuel M. King, of Lancaster, Pa. The invention consists in the combination of two rotary cutter heads journaled in reciprocating frames which are loosely connected together, and reciprocate in planes inclined toward each other. A table upon which the shingle is placed is located between these cutter heads, and both of the tapering sides of a shingle are planed in one operation by this mechanism.

A box nailing machine for making cigar or other similar boxes has been patented by Mr. Samuel Avery, of Phœnix, N. Y. This invention possesses considerable novelty, and by its use would seem to be a great labor saving machine. There is provided an inclined slide, down which the nails are passed, the imperfect ones falling through the opening in the slide into a receiver below, while the perfect nails pass down until they fall into position to be driven into the box. This feeding and driving operation is accomplished by a sliding driver operated by a treadle, which not only inserts the nail in the box with accuracy and precision, but drives it home. As many slides as desired may be arranged parallel to one another, all of them being operated in the same manner and with equal facility.

An improvement in cotton gins has been patented by Mr. David S Rogan, of Burnet, Texas. This invention provides means whereby the breast and guard can be readily and quickly moved and held out of their normal position for the purpose of clearing or freeing the cotton roll from the saws, and preventing injury to the operator by the saws. The gin breast is raised to clear the roll from the saws by moving a lever, thereby causing cams provided for the purpose to swing the breast out. At the same time the shield remains at the front of the saws as a protection; but when the saws are to be gummed, the breast can be raised and turned back, and the shield, being attached to it, is also carried out of the way, so that the saws are fully accessible.

AGRICULTURAL INVENTIONS.

Mr. S. O. Mason, of Snow Hill, N. C., has recently patented a cultivator which consists of improvements on the patent issued to him and Messrs. Pate and Dail in January, 1882. The main objects of these improvements are to give greater strength to the cultivator, prevent splitting of the cross beam, prevent turning of the shanks of the shovels, and rendering the blades of the shovels detachable.

A combined grain drill and fertilizer distributer has recently been patented by Mr. D. F. Hull, of Hagerstown, Md. It consists, first, of an adjustable keeper of peculiar construction, adapted to conform with the concave surface of each seed opening, and provided with a pointed lower end, arranged between the ordinary gum rollers of the drill to prevent the lateral discharge of the grain in passing the rollers. It is so contrived that the flow of the fertilizer is stopped in turning the machine or whenever desired.

A patent has recently been issued to Mr. David Woodward, of Clinton, Mich., for a plow jointer. The invention consists of an improved contrivance for the connection of the plow jointer for facilitating the adjustment of the jointer, and also for facilitating the discharge of the sward, manure, or rubbish into the furrow to be properly covered, and to cause it to escape from the supporting arm of the jointer and prevent clogging, as is common with jointers as ordinarily attached.

Mr. J. A. Bonitz, the well known publisher of the *Messenger*, at Goldsborough, N.C., has obtained a patent by assignment from Mr. L. B. Stith, of the same place, for a cotton stalk chopper, which may also be used on tobacco and corn fields. This machine consists in a series of revolving cutters arranged on radial arms, which operate horizontally with the ground. A conical roller is journaled to the frame in front of the revolving cutters, to direct the stalks to the knives as the machine is propelled over the ground. The machine is strong and simple in its construction, and it is believed that it will be generally adopted at the South when its merits become known. Mr. Bonitz has commenced the manufacture of the machine at Goldsborough.

MISCELLANEOUS INVENTIONS.

Mr. Abbott Arnold, of Houston, Texas, has secured by letters patent a new bale tie, which has the advantages over many others in cheapness, simplicity, and strength.

Mr. Edward A. Smith, of St. Albans, Vt., has obtained a patent for an improved smoking tube, the invention consisting of a screw threaded plug for holding the cartridge within the tube.

A safety stirrup for riding saddles has been patented by Mr. Philip Ganzhorn, of Washington, Ill. This stirrup is provided with a toe guard, and with a tilting plate for insuring the ready escape of the foot of the rider in case he should be thrown from the horse.

Mr. Ivison H. Huddleston, of New Berne, N. C., has patented a composition for greasing plug tobacco moulds, which consists of olive oil and beeswax mixed together in certain proportions, with or without flavoring, as may be desired. One-half interest in this patent has been assigned to Mr. L. V. Morrel, of Greenville, N. C.

Mr. Arthur W. Bush, of Boulder, Colo., is the patentee of a combination watchmaker's tool for holding second hands while reaming out the socket to fit the watch, also for adjusting the pin jewel in the roller table of a watch and similar other purposes.

Mrs. Jane Amelia Ray, Brooklyn, N. Y., has received letters patent for an improved elastic metal corset stay plate, which is intended to protect the ribs or bones pocketed in the fabric of corsets against breakage, and to afford a better support to the body of the wearer.

Mr. William Clemson, of Middletown, N. Y., has patented a buck saw frame, having two braces reaching from the center of the crosspiece of the saw frame diagonally up to the upper ends of the side pieces of the frame, whereby the frame is braced in a simple and very efficient manner.

Messrs. J. H. McConnell and M. W. Chandler, of Pultney, N. Y., have patented a pail or basket handle. A short distance above the upper edges of the basket shoulders are provided, under which the edges of the basket cover are passed for the purpose of holding it on the basket at the middle.

Mr. Andrew C. Emmick, of Columbus, O., has recently patented an improvement in hollow plugs for axle skeins. The interior of the hollow plugs are welded on the inside of axle skeins, and by running a lag screw from the point of the skein to the axle, all air and moisture are excluded.

A simple and convenient lamp kettle has been recently patented by Mr. William Pountney, of Port Jervis, N. Y. It is so constructed as to rest on the top of a sectional lamp chimney, and does not interfere with the light when in use. A spout is provided which will hold and cook an egg at the same time the water is heating within the kettle.

A quilting frame for suspending a quilt so that a sewing machine can be brought in use in the quilting operation, has recently been patented by Robt. B. Bledso, M.D., of Alvarado, Tex. The apparatus is simple in construction and effective in use, enabling the quilting to be done with expedition and with very little fatigue to the operator.

Mr. H. C. Leonard, of Covington, Ky., has patented a machine intended for use for spinning and twisting all kinds of fibrous materials for the manufacture of rope or cords, or other manufactures produced by twisting or spinning. The machine may twist as many strands as are required, from a smaller machine or from bobbins set in a rack.

A simple and effective faucet for drawing liquids has recently been patented by Mr. Frank McCabe, of Providence, R. I. It is specially designed for a beer faucet, but may be applied to any cask or barrel, and is so constructed as to avoid leakage around the valve when the faucet is open. It is also provided with a plunger for forcing in the bung.

Mr. La Fayette Hartson, of Wyoming, Ia., has patented an improved harness buckle and loop. The object of the invention more especially is the securing of the end of the strap to the buckle, without the necessity of stitching the buckle loop to the main strap. This is accomplished by riveting the strap between two metal plates, thus securing a stronger connection than is possible by sewing.

Mr. John P. Wilkinson, of Abbeville, Miss., is the patentee of an improved guard for the key holes of locks. This guard consists in a sliding block equal in thickness to the space between the plates of the lock case, and arranged to slide backward and forward by means of a thumb bit projecting through the bottom of the lock, and is constructed for right or left hand doors.

Mr. Daniel T. Chambers, of Washington, D. C., has obtained a patent for an improvement in glove fastenings. This consists in a flap which passes around the wrist. An inner strap is also provided which passes through a loop on the other side and holds the glove close to the hand, leaving the palm entirely smooth. This invention is an improvement upon a patent granted to same inventor in February, 1883.

Mr. W. E. Liddle, of Salem, N. Y., is the patentee of an improved mode of attaching ornamental pendants to the wearer's ears, without the aid of either hook or spring. The ear wire is inserted through the ear in the usual way, but instead of ending in a loop the wire is bent upward, forming a supporting leverage behind the ear, which obviates every danger of the pendant becoming detached from the ear.

Mr. Ernst Caywood, of Vining, Kan., is the patentee of a floor clamp which consists in a clamp holder having a hook on one end and jaws so related to one another as to engage with the joist and prevent slipping. This clamp may be readily removed and adjusted for receiving a new floor board. The boards are pressed into place with but little effort on the part of the carpenter, by the use of one of these clamps.

Mr. Lebbeus Simkins, of Marshfield, Oregon, is the patentee of an apparatus intended to prevent boiler explosions. The inventor provides a broad float attached to a gas pipe, the latter of which has perforations near the float for carrying off the gases which the inventor claims to be the cause of boiler explosions, thus rendering boilers safe with a very simple contrivance.

An improvement in churns in which the ordinary dash is dispensed with is the subject of a patent granted to Mr. W. W. Kitchen, of West Union, Ia. A pendulum is attached to the box, and the globules of butter are released by the impact of the cream in being dashed from one side of the receptacle to the other, by the oscillating movement imparted by the weighted pendulum.

Mr. James Schofield, of New York city, obtained a patent on a speed accelerating machine in December, 1879, and he has recently obtained a patent for some improvements on the original machine which are intended to render the machine more durable and effective in its results. The noise is also very much diminished in the improved machine over the original one when in use.

Messrs. J. C. Jay, Isaac Jay, and B. L. Chambers, of Arapahoe, Neb., have patented an improved cultivator, which consists of a contrivance whereby the wheels of the cultivator may be guided so as to enable the plowman to so control the machine that he can protect the corn from injury by the wheels of the cultivator, when the horses fail to properly guide it.

An ingeniously arranged desk for the convenience and use of draughtsmen, engravers, type setters, etc., has recently been patented. This desk is mounted in such a way that it may be raised by rotating a hand wheel which actuates a pinion gearing with a rack upon one of the supports of the desk. In this way the desk may be raised to any height desired and locked in any position. The inventor of this improvement is Mr. H. William Groebl, of Vincennes, Ind.

Mr. Robert B. Bledsoe, of Alvarado, Tex., is the patentee of an improved quilting frame, which instead of being supported on legs is suspended from the ceiling, so that when not in use it may be drawn up close to the top of a room out of the way. By a simple arrangement of pulleys the material to be quilted is easily turned, so that only one-half need be exposed at a time, and when that portion is quilted the frame is turned, bringing the other half before the operator.

An improvement in fire escapes has recently been patented by Mr. Henry Redden, of New York city. Two posts are erected on opposite sides of the doorway of a building, and extend upward to the roof. A car is provided to be run up and down in grooves in these posts. The mechanism for operating the car is at the base of the posts. When the escape is not in use, the platform of the car rests upon the ground in front of the door, and serves as a stepping stone.

An improvement in horizontal steam boilers designed to make the most economical use of fuel, and to secure great strength and heating surface, has recently been patented by Mr. Geo. Kingsley, of Leavenworth, Kas. The boiler is also so constructed as to be readily cleaned of scale, and the inventor claims that in case one of the flues should become ruptured, no greater damage than the extinguishment of the fire would be the result.

Mr. A. C. Osborn, of Clarksburg, W. Va., has recently patented an improved mechanism for operating and adjusting the set works of saw mill head blocks. It consists, first, in a device for regulating the throw of the hand lever by which the ratchet wheels are operated to move the log; and, second, in a rack and pinion device for turning the pawl of the hand lever into position for moving the ratchet wheels in either direction.

An adjustable attachment for drawers, which can be used for reading, writing, etc., has recently been patented by Mr. T. L. Jowett, of Boston, Mass. A leaf is hinged to the inner surface of the drawer front of a bureau, table, or other furniture, so it can be swung into the drawer, or raised to rest on the edge of the top plate of the table, making a convenient rest for holding a book while reading, and answering for a writing desk.

Mr. W. S. Ditterline, of Mauch Chunk, Pa., has secured a patent on a tremolo attachment for cornets, whereby the tone produced is vibratory. The invention consists of a tube adapted to constitute the echo tube of the cornet, or a mute tube to be applied to the bell of the instrument, said tube having a valve or disk connected thereto by a spring or lever, and arranged to vibrate by the pulsations of the wind escaping from the tube.

An improved radiator has recently been patented which consists in a base chamber having the usual supply and discharge pipe and a series of parallel upright tubes connected with the base. For producing perfect circulation a chamber is located above the tubes. This radiator may be used for either steam or hot water, and secures a larger extent of heating surface for its size than many other radiators. The inventor is Mr. Thomas McAvity, Jr., of St. John, New Brunswick, Canada.

A ditch and road scraper has recently been patented by Messrs. J. H. and T. J. Gill, and J. W. Hedges, of Richwood, O. It consists of a sheet metal scoop pivoted near the rear and about the top of the sides between a pair of beams, from which pivots a pair of curved braces extend forward along and through the beams to the side of the scoop, to which they are connected. Spring latches are provided for holding the scoop in position. By means of trip levers the scoop is unfastened at will for dumping.

Mr. Joseph Reid, of Wyandotte, Kan., has received a patent for a refrigerating apparatus intended to effect more complete utilization of the cooling power of air, or ammonia, or any other substance which, having been compressed, will absorb heat while it is expanding, particularly in that class of apparatus wherein the gas or ammonia is expanded in pipes. This the inventor accomplishes by an arrangement of a series of cooling pans placed one above another, between and around which the cooling substance is circulated.

An improved washing machine has been patented by Mr. G. F. Knight, of Carroll, O. The bottom of the wash box is in the form of a double curve. Two cylindrical plungers, one of which is convex and the other concave, and they are so arranged as to be brought together and separated from one another by means of a lever. By moving the lever up and down the clothes between the compressors or plungers will be alternately squeezed and released, causing the water to circulate through them. With this machine the labor of washing is reduced to a minimum.

Mr. Max Lesser, of Athens, Ga., has obtained a patent for an improved boot cleaning apparatus. The box of the scraper is provided with brushes on its bottom and sides for removing the remaining mud and dust, after the scraper has performed its office of removing the heavier mud from the shoes. A metal strip with a forked end is likewise provided for removing overshoes from the feet of the wearer. The combined arrangement of the parts, and the handy purposes to which they are put, render the new boot cleaner quite an important article in the household.

A new weather strip for doors has been patented by Mr. John Shoemaker, of Garner, Ia. This improvement consists of a strip of wood secured permanently to the door, and of another strip which is hinged to the first mentioned strip. The latter is provided with a spring which retains it in an elevated position when the door is not closed. A block is attached to the door frame, and when the door is closed the movable strip is brought to bear against the block, and turn the strip down on its hinges, pressing the rubber section against the door sill, which prevents any draught of air or dust from entering the room.

An improved apparatus for fitting felly sections to their places within the tire, before inserting the spokes, has been patented by Mr. Charles H. Smith, of Eau Claire, Wis. The inventor inserts within the closed tire, while hot, a number of felly sections and arranges them so that when bearing one against the other, they will leave a vacant felly section space. By applying pressure to the exposed ends of the separate felly sections to force them apart, then entering a final felly section in the vacant space and allowing the tire to cool after being driven home, the process is completed.

A measuring instrument for the use of tailors has been patented recently. This device consists in a graduated belt to be passed around the body of the person, which belt is provided with sliding plates to extend over the shoulder. Other graduated sliding plates with their free ends turned upward are placed in front and indicate the height of the shoulder and size of the arm. After all the adjustments have been made on the instrument, the pattern is traced from the machine on paper by means of a tracing wheel, for the use of the cutter. The inventor is Mr. Nicholas Lennards, of Harvard, Ill.

An improvement in two wheeled village or road carts has been patented by Mr. Lot Green, of Rushville, Ind. The object of the invention is to relieve the body and seat of the wagon from the sudden jerking motion caused by the motion of the horse. In this improvement the body of the cart is not mounted directly upon the axle, but upon springs which are suspended from the side bars of the vehicle, these latter being supported upon the axle by means of bracket irons. In this way the body of the cart is so loosely connected with the running gear that it is relieved of the jolting, jerking motion so disagreeable to the rider.

An improvement in ore and stone crushers has recently been patented by Mr. Daniel Brennan, Jr., of Orange, N. J. The inventor provides a movable jaw the lower part of which is adjustable independently of the movement of the upper portion, and has a simple contrivance for regulating the movement. The movable jaw is hinged to the ridged jaw at its upper portion by a U-shaped bolt, which enables the movable jaw to be readily taken from the main jaw and reversed end for end, or side for side, so that as the jaw becomes worn it may be reversed, thus rendering the entire machine more enduring. The inventor is a practical road maker, and his experience in crushing stones for macadamizing purposes has led to this improved machine, which it is believed is destined to supersede many of the stone crushing machines in use.

A very conveniently contrived gate for use on stock farms has recently been patented. The invention is designed to facilitate the opening and shutting of gates, and also to prevent cattle and horses from passing, while free exit to sheep, calves, etc., is permitted. This gate consists of two sections, one of which, the main gate, is constructed so as to prevent the passage even of small stock, while the other section is the stock gate, and allows the passage of small animals. The main gate is actuated by a cord over a rotating drum, and the stock gate is connected with the end of the main gate, and may be opened and closed simultaneously, and by the same mechanism as the main gate. The inventor is Mr. A. J. Sweeney, of Pana, Ill.

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Business and Personal.

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For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 78.

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The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

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Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Improved Skinner Portable Engines. Erie, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 62.

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

American Fruit Drier. Free Pamphlet. See ad., p. 94.

Brass & Copper in sheets, wire & blanks. See ad. p. 92.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Machine Diamonds, J. Dickinson, 64 Nassau St., N.Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 92.

Our goods speak for themselves, and a trial will convince the most skeptical of their superiority over all others. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Upright Self-feeding Hand Drilling Machine. Excellent construction. Pratt & Whitney Co., Hartford, Conn.

20,000 Duc Spherical Elevator Buckets, sizes 3½ to 17 inches, constantly on hand. Telegraphic orders filled. T. F. Rowland, sole manufacturer, Brooklyn, N. Y.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 92.

Steam Pumps. See adv. Smith, Vaile & Co., p. 93.

Straight Line Engine Co., Syracuse, N. Y. See p. 92.

NEW BOOKS AND PUBLICATIONS.

THE STRAINS IN FRAMED STRUCTURES. By A. Jay Du Bois, C.E., Ph.D., Professor of Dynamic Engineering in the Sheffield Scientific School of Yale College. John Wiley & Sons, New York, 1883.

This work is intended as a practical guide to the civil engineer as well as a text book to the student. It gives the principles of all calculations for framed structures, whether of wood or iron; applies these calculations by examples to existing specimens of work; shows simple and combination construction of bridge and roof girders; treats on the continuous girder, pivot or swing bridge, and braced arch; considers the suspension system of bridges at length, and contains a full appendix for the advanced student and the engineer, illustrated by plates and accompanied by mathematical calculations. A specimen contract for a railway bridge, with specifications, will be found of use.

THE IROQUOIS BOOK OF RITES. Edited by Horatio Hale, M.A., author of the "Ethnography and Philology of the United States Exploring Expedition." D. G. Brinton, Philadelphia.

The object of this volume, which is "No. 2 of Brinton's Aboriginal American Literature," is to show that the Indian races on this continent have a history: or at least that in the confederacy of the five nations—afterward the six nations—existed the materials for an unbroken history; almost if not quite connecting the present Indians with the mound builders. The compiler of these Indian fragments of an unwritten history endeavors to show that what otherwise would have degenerated into corrupted tradition, became, by the usages of the Huron-Iroquois people, reliable and credible history, the oral records being repeated in public on stated occasions, each special and separate event being symbolized by a string, of wampum of particular arrangement of colors, which was exhibited at the time of the recitation, thus forming a system of mnemonics subject to public criticism. These nations also allowed the equal legal rights of women, according them an important part as to duty and privilege in public affairs and far more freedom in domestic life than is given to the women of some European countries in our day. These six nations had a federal system quite similar in important particulars to our own, and like the union of the States capable of indefinite expansion. In fact, the book is full of interesting facts about a people whose posterity and representatives have received scant justice at our hands either as individuals or as survivors of a social and political system worthy the attention of ethnologists.

DIE KRIEGSSCHIFFBAUTEN, 1881–1882. By J. F. Von Kronenfels. A. Hartleben, Wien, Pesth, Leipzig, 1883.

This work is a continuation of a former work by the author on the "Floating Craft of the Naval Powers;" and in this continuation he describes the men of war, torpedo boats, etc., built by the several powers during the years 1881 and 1882. The naval powers are arranged alphabetically, and receive more or less attention according to the greater or less number of vessels built during these two years. England, Italy, and Russia take the lead, as they have increased their navies more than any of the other nations. The author has also devoted considerable space to the navy of the United States, giving a description of the partly completed vessels, and the construction and armament of the new steel cruisers, contracts for which are about to be given out. This work is provided with eighty-two wood cuts.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. E. B. asks for a receipt for a stone color whitewash for an asphalt pavement, the color of which is objectionable. Will white Portland cement stick if made into a wash? A. A thin coat of Portland cement is, probably, the best thing. It must be applied of such consistency that it will not flake.

(2) G. L. M. asks: 1. Are the binding posts of the electrical machine described in SUPPLEMENT 161 insulated? A. Yes, they are insulated by the wooden base of the machine. 2. How are the wires connected with the posts? A. Clamped by means of screws entering the posts from the bottom. 3. Is the soft iron used for electro magnets common cast iron? A. Soft gray cast iron.

(3) W. M. M. asks: 1. What weight will two air tight boxes carry; the boxes being 6 x 10, 12 feet long? A. 45,000 lb., including their own weight. 2. Also, the weight required to sink them one foot in water? A. 7,500 lb.

(4) A. M. J. asks: Will you give a simple method for bleaching straw? A. The cheapest method for bleaching straw consists in exposing the material in a closed chamber to the fumes of burning sulphur. A more expensive way is to dip the straw in caustic soda, and then treat with Javelle water or calcium chloride.

(5) H. E. W. writes: I have about 25 gallons of copper solution, spoiled by putting it in a pitched vat, the pitch becoming dissolved in the solution. Can you tell me through the columns of your paper a way to extract the pitch or in any way utilize the solution, and will you please tell how to prevent nickel salts from crystallizing on the anodes and from settling at the bottom of the vat? A. The copper can be recovered by precipitating it with iron, or by throwing it down by the battery. The nickel salts should not settle to the bottom, nor should they crystallize on the anodes. It is probable that your current is too strong. Consult article on nickel plating, SCIENTIFIC AMERICAN SUPPLEMENT, No. 310.

(6) J. F. writes: I have a lot of candle wick on hand of which the preparation has evaporated in course of time, and now it does not consume while burning. I wish to make it useful; can you give me a receipt for preparing bleached wick for beeswax candles? A. There are various solutions used. Among others, 1 lb. of boracic acid dissolved in 75 pints of water; in this the wicks are soaked for about three hours. See article on "The Manufacture of Candles," SCIENTIFIC AMERICAN of December 17, 1881.

(7) L. P. S. asks: 1. In running two balance wheels, one weighing one ton and the other two tons, but so arranged that each would have the same amount of friction in the boxes and in the air, and both of same speed and diameter, which would require most power? A. Having the *same* friction, not in proportion to weight, but total amount, and the same air resistance, there would be no difference in power. 2. In doubling the speed of a balance wheel, how much is gained in momentum? A. To double the velocity of your fly wheel increases its "regulating power" or momentum four times; the regulating power is as the square of the velocity.

(8) C. R.—Zinc has the greatest degree of expansion of any of the metals. A bar 9 inches long will expand to 9·026 when heated from 32° to 212°, and in proportion for intermediate amounts of change in temperature. It melts at 740° Fahr.

(9) J. E. M. asks if it is injurious to lumber to keep it in a dry house at 90° after it is dried. A. A temperature of 90° Fah. does not affect lumber for a short time, but will make it brittle and hard to work after several months.

(10) A. W. W. writes: I have a boiler I desire to test; please inform me if the test by water expanded by heat is good, and to what extent I should carry it to insure 100 pounds steam. A. We do not recommend the testing of boilers by the expansion of water at temperatures up to 212°. If there is the least leak, you have no means of supplying the loss. If you heat the water hot enough to supply leakage by the generation of steam, you will run all the risk that will occur in raising steam to the required test. The best way is to test with a pump to a pressure 50 per cent greater than the working pressure.

(11) A. K. writes: We have a round discharge pipe 60 feet long, of 40 inches diameter. A head of three feet of water can be maintained, without any fall at discharging end. What kind of a wheel would be most convenient and powerful, and what equivalent in horse power could be obtained? A. If you have no fall at the discharging end, you can only use a current or flutter wheel. With such a wheel you will not be able to obtain more than 3 to 4 horse power.

(12) D. A. O. writes: Cistern builders here wall them up with brick, laid in cement, but they invariably crack and leak. I have heard of cisterns being made by cementing on the earth, using no brick except at top, which gave good results; please give me a method for building the cement cistern. A. Brick cisterns leak because they are not well backed up with cement puddle and rammed, so that the pressure does not gradually bulge the walls out. Build cement cisterns with a puddle of sharp coarse sand and cement rammed between the crib and the earth wall. A cistern with the earth walls plastered with cement is not reliable. In the brick cisterns the brick wall may be only 4 inches thick, and only act as a crib, which must be thoroughly backed. The face plastering of cement helps, but is not alone reliable for tightness.

(13) C. R. I. asks how to remove the tarnish from German silver drawing instruments. A. Use very fine emery paper, or crocus paper.

(14) E. H. D. asks for a wash or size that can be applied to whitewashed walls to make wall paper stick, or else something to soften the whitewash so that it will readily scrape off. I have used nearly all of the sizes common to paper hangers; but my work is almost entirely on ceilings, and generally they have about an eighth of an inch of whitewash on them, which is very hard and sometimes impossible to get off. A. Wet the walls, and remove the whitewash by scraping.

(15) F. H. asks: What will destroy cockroaches in pantry, commodes, or in any place where care that anything dangerous to the persons occupying house should be taken? A. It is said that powdered sugar and borax strewn about the places frequented by the cockroaches will destroy them.

(16) J. H. G. writes: I have an electro medical battery. It has a current so strong that a man cannot hold it, but it can be made lighter at will. Can I use this battery current for gold, silver, and nickel plating? How can I make a gold or silver solution? A. Your battery disconnected from the coil might answer for plating small articles. The current you mention as being so strong that a man cannot bear it, is not adapted to plating. For instructions in plating, see SUPPLEMENT No. 310.

(17) C. E. A. asks: What can be put on perforated cardboard, so as to render the same impervious to ink? I wish to use the cardboard as a stencil to make very small round dots. A. Try paraffin.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. H. P.—The specimen is pyrite (iron sulphide). It may carry gold.—A. S. B.—No. 1 is an alloy, probably lead and zinc. No. 2 is iron pyrites (iron sulphide). No. 3 is quartz carrying the pyrite; it probably carries gold. No. 4 is the rock in which the pyrite occurs; it is of slaty nature.

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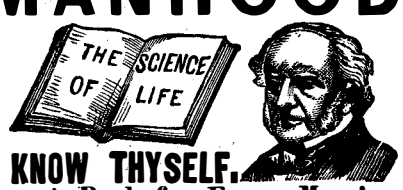

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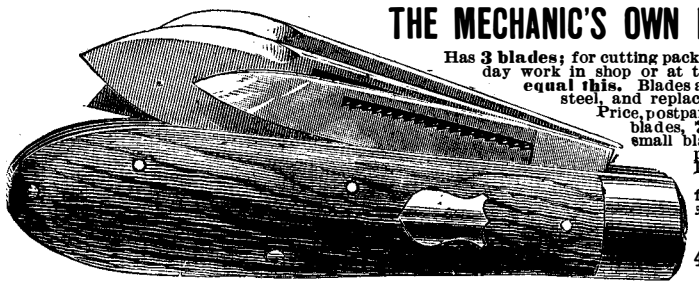

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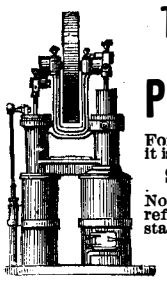

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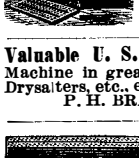

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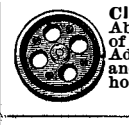

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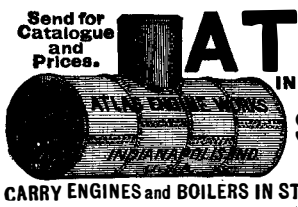

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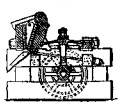

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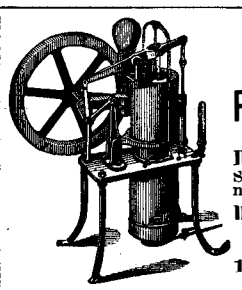

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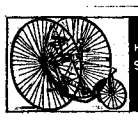

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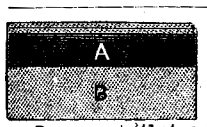

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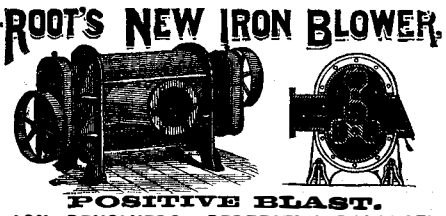

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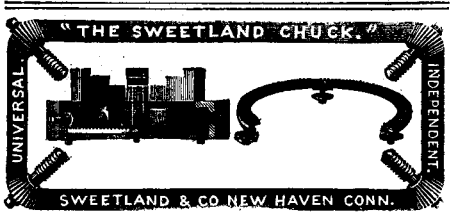

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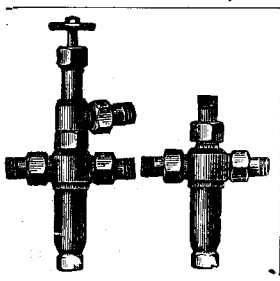

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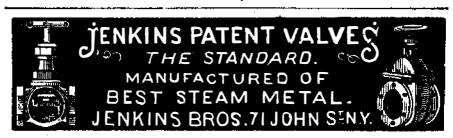

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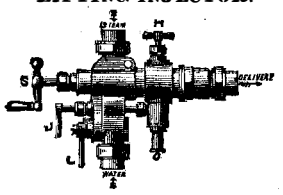

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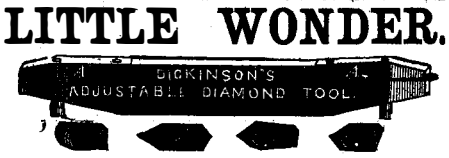

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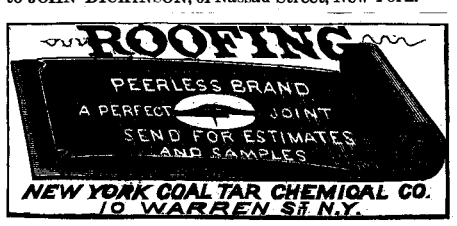

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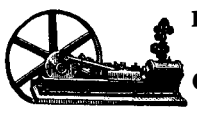

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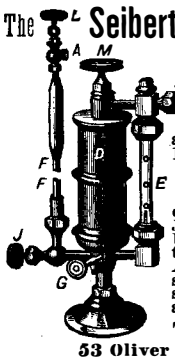

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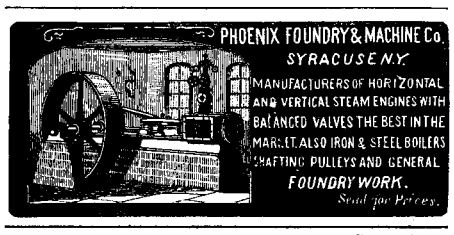
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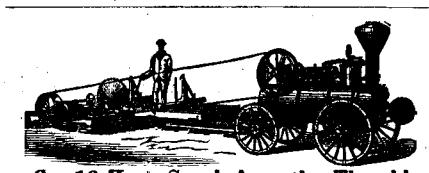
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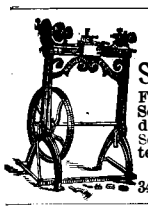
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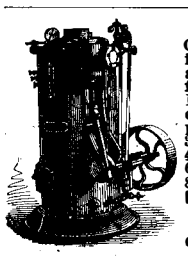
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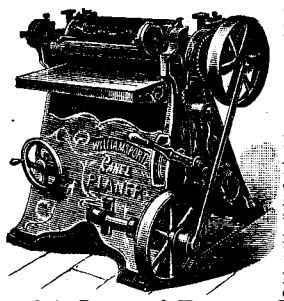
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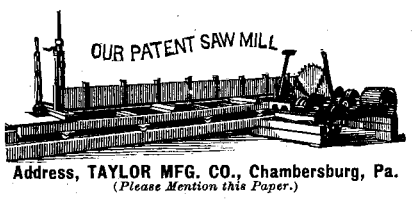

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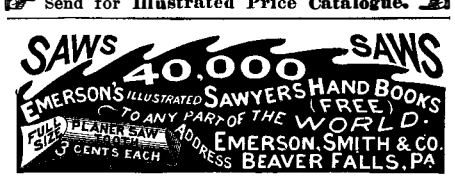
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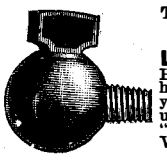
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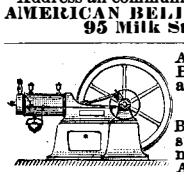
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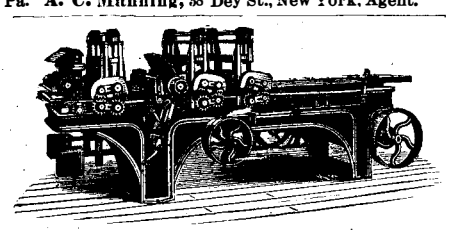
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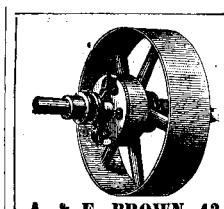
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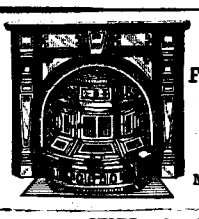
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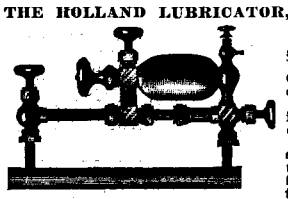
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